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Valueless Work Reports

EVERY enginehouse foreman knows the locomotive condition report which, filled in carelessly or as a mere matter of routine by engineman or inspector, is really worse than valueless. It not only fails completely as an aid to the maintenance forces but represents a waste of good paper and of the inspector's time who makes it out. The difficulty with many of the forms used for these reports is that they are entirely too abbreviated to give information on important details, and the inspector becomes accustomed to making stereotyped notations opposite familiar items. How often do the words "Open" and "Examine" appear all the way down the form. One of these reports recently carried the illuminating information "Examine" opposite the "Fourth Course" when the particular boiler involved had only three courses. Both back cylinder heads were reported leaking when only one leaked, and the leak on the other side coming from the valve chamber head. On another engine new side sheets requested were proved unnecessary and a cracked cylinder was not reported, resulting in a long and largely avoidable delay while this locomotive waited for a new cylinder. Accurate comprehensive condition reports are needed. Enginemen and inspectors will provide just as poor reports as enginehouse foremen and master mechanics are willing to accept.

The Great Development in Motor Transport

THE past 12 months have seen a remarkable development in the field of transportation by motor buses and trucks. While the general development has been going on there has been an even more striking development in the adoption of motor vehicles by the steam railways. It is estimated that there are in operation today more than 70,000 motor buses. Of these, a comparatively small proportion are owned directly or indirectly by the steam railways. But a year ago, the proportion was even smaller, much smaller, in fact. During the past 12 months the interest among the steam railways in the possibilities of motor transportation has quickened extraordinarily. The results being obtained by such steam railway pioneers in bus operation as the Spokane, Portland & Seattle and the Boston & Maine and such pioneers in the use of trucks for freight haulage as the Lehigh Valley and the Pennsylvania, have attracted universal attention and the closest study upon all sides. The possibilities of motor transport, to better the service provided on their rails at a lower cost than the cost of rail service in certain instances, has led many of the railways to make definite plans on their own part for the adoption of motor vehicles. What the New Haven, the Great Northern, and others are doing with buses, what the Boston & Maine, the New York Central and others are doing with trucks, many other railroads are planning to do. What will be the outcome of this intensified interest? Forecasts are easy to make and difficult to prove accurate. But there seems to be little doubt that by the time the next convention of the Mechanical and Purchases and Stores divisions are held at Atlantic City, the list of roads operating buses and trucks will be greatly lengthened and that the proportion of buses operated by steam railways to the total number of buses operated will be much more impressive than it is today.

System Versus Initiative

AMERICAN railroad shops have gone through a period of transition during the past ten years in which one of the outstanding features has been the development of systems for increasing shop output. But the better organization of shop facilities and methods has not alone been responsible for the marked increase in the productive capacity of railway repair plants. Coincident with the improvement in methods has come a better understanding of the problem of human relationships. The best in men seems to be brought out when the most is demanded of them. Some of the records of output that have been made recently have been due not only to the development of methods and in the character of machinery, but to the improvements in organization that have been brought about through the initiative of men. It seems that there should be a point of balance in the development of systems of any kind beyond which it might not be advisable to proceed without careful consideration of the eventual outcome. In the development,

for example, of shop scheduling systems, some of the largest shops are operating scheduling systems so simple that one wonders how it is possible for them adequately to function. On the other hand, one witnesses the development of extremely elaborate scheduling systems in which the details are so finely worked out that there seems to be little scope for the exercise of individual initiative on the part of the supervisors in the shop. Here, it seems, is a point worth pausing to consider. Experience has proved that a shop organization which can function normally in times of stress or unusual conditions is better able to cope with unexpected changes and conditions than a group of men which has become accustomed to relying on the continued functioning of a delicately balanced production system. It seems that the simpler a production system may be, the greater the individual initiative required to co-ordinate the functioning of all shop departments properly. In the development of any system to control shop output, it should be borne in mind that the resource and initiative of shop supervisors depends a great deal upon how much they may be required to rely upon their own judgment. System is essential, but not at the sacrifice of the development of men.

Know Enginehouse Costs

THE Southwestern road, referred to in these columns yesterday as setting and achieving a definite goal of money saved by reduced fuel consumption in the first quarter of 1925, has also proved the value of other equally definite operating objectives in the turning of power at engine terminals, handling l.c.l. merchandise, switching cars in yards, reducing freight and passenger train overtime and other similar items. In reducing enginehouse expenses on the system, the quota to be saved at each terminal during the first quarter of 1926 was established, based on handling power at ten cents less per locomotive than in 1925, except at one point where a considerably larger saving was required owing to important improvements which greatly facilitated locomotive conditioning operations. The quotas to be saved ranged from quite small amounts at terminals turning but a few locomotives to $2,000 or over at larger terminals, the total quota to be saved in the first quarter of 1926 amounting to $16,833. The actual saving was $10,415, which, while considerably below the mark set, indicated real progress in more efficient handling of engines at terminals. This general improvement was obtained in spite of the fact that a number of enginehouses not only failed to make their respective quotas of saving but actually handled locomotives at a considerably greater unit cost than in 1925, thus indicating that certain conditions at these terminals have probably been overlooked and need correction. A long step has been taken toward more efficient enginehouse operation when railroad men *know* how much it costs to turn power at each terminal. They can then concentrate attention on improving terminals not up to the required standard.

The Function of a Committee

THERE are two opposing views as to the function of a committee in an organization such as the Mechanical Division. One of these is that a committee should receive a specific task to perform for the larger organization, the nature and scope of which are to be set forth in such a way that little is left to the committee but to carry out the specific instructions and, after rendering its report, be discharged. The other is that a subject be assigned to a committee without anything but the broadest instructions, the committee to develop its own program in accordance with its conception of the needs of the situation. The latter principle more nearly represents the nature of the assignments of the standing committees of the Mechanical Division than the former, but, unfortunately, the standing committees have not always availed themselves of the opportunity which this conception implies. Some splendid committee work is being done in the Mechanical Division at the present time, however, and more than one of the committees is taking advantage of the broad opportunity for the exercise of initiative in handling its work. Two examples of this at this year's convention are found in the reports of the Committee on Locomotive Design and Construction and of the Committee on Wheels, presented at yesterday's sessions.

In the sub-committee report on Designing Locomotives to Reduce Track Stresses, the former committee is doing a splendid piece of work in developing basic data. While the results of this work may not be immediately of direct value to the designer, it is the kind of work which must be carried on before the features of locomotive construction effecting track stresses can be designed intelligently to produce the least stresses. The Wheel Committee has taken a subject which for many years was regarded as one for routine handling of minor dimensions affecting standardization. The work of this committee at the present time is stimulating development in all types of wheels which, while it may ultimately require considerable modifications in the standards of the association, will undoubtedly be of tremendous assistance to the manufacturers of cast iron, cast steel, rolled and forged steel wheels in developing their products to high states of perfection, that will be of great economic value to the railroads which use them. Every committee in the association should be encouraged to exercise similar initiative in the study, investigation and development of the materials, the equipment, or the subject assigned to it. In this way the railroads will reap the benefit of continuing progress in rolling stock and motive power, of the highest type.

Engineers Accomplishing Big Things

A REMARKABLE feature in the development of human relationships is the ability of competing concerns to get together and talk over their mutual problems. It was not many years ago when the average grocery man would not speak to his competitor across the street, but today, through such organizations as the Chamber of Commerce and Rotary Club, he meets with his neighboring competitor and they discuss questions of direct concern to their business. The American Railway Association operates on the same fundamental principle.

The profession of engineering has also kept step with the trend of the times and has developed a high code of ethics governing professional conduct and relations with each other. For a number of years the American Society of Mechanical Engineers has been able to do considerable constructive work by bringing together mechanical engineers engaged in a wide variety of industries to discuss technical problems pertaining to their profession. In order better to serve the diversified industries represented in its membership, divisions have been organized whose function is to see that the interests of the industry are properly served.

The Railroad Division of the American Society of Mechanical Engineers has included in its membership mechanical engineers engaged in railroad work, railroad supply, technical schools and in consulting practice. These men, many of whom represent the finest mechanical engineering talent in the country, get together at frequent inter-

vals during the year to present papers on and discuss railway mechanical engineering problems. These meetings, as well as the investigations carried on by the Railroad Division, are conducted according to the highest standard of engineering ethics and with the sole objective of obtaining the facts. Both the Mechanical Division of the American Railroad Association and the Railroad Division of the American Society of Mechanical Engineers have, however, been working independently of each other. But both organizations can accomplish greater results by working in co-operation with each other. Each is in a position to be of service to the other.

The Mechanical Division has accomplished wonderful results through its organization and committee work. Its work has, however, reached that stage when it could quite profitably use the mechanical engineering talent to be had in the Railroad Division of the American Society of Mechanical Engineers. Cooperative service by the two organizations should be a big help to the railroad industry.

Air Brake Association Does Constructive Work

ONE organization which contributes in no small way to the effectiveness of the Mechanical Division's work in improving brake conditions is the Air Brake Association, which includes in its membership all but two of the Committee on Brakes and Brake Equipment. This association is international in scope, with a considerable number of members from Canada, Mexico and foreign countries. A steady increase in attendance at its annual meetings has been accompanied by a corresponding improvement in the quality of the reports and character of the exhibits. While the work of the Mechanical Division is largely legislative in character, the Air Brake Association is devoted solely to efforts along educational lines. This association has a special incentive for its well-known custom of holding its conventions in a different section of the country each year, because, in addition to attracting new members from the respective districts visited, all of the members are enabled to observe brake operation on roads in different parts of the country under widely varying conditions. In response to an urgent plea by Pacific coast members, the 1925 convention was held at Los Angeles, Cal.; it was a marked success and, in addition to other advantages, resulted in the enrollment of a number of new members from the western roads not otherwise obtainable. The association, will probably not go again so far from the geographical center of population.

The 1926 convention of the Air Brake Association, held at New Orleans, La., in May, as reported on page 1253 of the *Railway Age,* for May 8, was by far the largest and most important in the history of the association, with great potential possibilities for improved general air brake practice. Between 700 and 800 members and guests were in attendance, and the statement was made several times on the convention floor that the opportunity for instruction afforded by the reading and discussion of the reports was, hardly greater than that obtainable by a study of the comprehensive exhibits and talking with the engineers and trained specialists representing the supply companies.

The way in which the Air Brake Association is looking into questions vitally affecting the pocket book of the railroads, is shown by one of the reports presented at the 1926 convention, namely that on Brake System Leakage. It is shown in this report that only a small proportion of the compressed air furnished to operate train brakes is actually used in brake applications, the balance being lost by leakage from the train line and other parts of the brake system. In addition much air is lost in leakage from pipes to auxiliary air-operated devices on the locomotives. Following two years' intensive work by a large and capable committee, specific conclusions and recommendations have been prepared which would do credit to a committee of any technical society. The Air Brake Association by continuing its effort along the lines already laid down, should prove an important aid to the Mechanical Division in developing information and recommendations which will accomplish real results in raising the general standards of air brake maintenance throughout the country.

The Power Plant Idea

THAT the conception of what is a locomotive, is progressing can hardly be doubted after one has inspected the steam locomotives on the track exhibit. It has not been long since the locomotive was regarded as so many tons of metal which were to be secured at as low a price per ton as possible. While, no doubt, such ideas still pertain in some instances, there is marked evidence of a growing appreciation of the fact that the locomotive should be regarded as a power plant and purchased on much the same fundamental basis as would obtain in the case of a central station power plant.

Recent developments indicate that the growth of this new conception is accelerating. At the outset the expression of the idea was evidenced in the addition of the capacity and efficiency increasing devices, which have become thoroughly established during the past 20 years, to locomotives of strictly conventional fundamental design. With the growth of the idea, there has come about a marked change in the treatment of the locomotive itself, as distinguished from the devices which have effected such marked increases in capacity and efficiency. We now see a rapidly growing willingness to forget the conventionalities of locomotive form and proportions, or at least to submit them to a critical examination in which good reasons for their retention must appear if retained.

On the exhibit tracks are the three-cylinder locomotives built by the American Locomotive Company for the Lehigh Valley and the New York, New Haven & Hartford, in which the three-cylinder principle has been applied to increase traction in relation to the weight on drivers and which has made possible the development of a six-coupled wheelbase in the new Union Pacific type locomotive. There is the McClellon water tube firebox on the New Haven locomotive, with its possibilities for increased boiler pressure and hence increased horsepower capacity with given cylinder sizes. There is the Baldwin built Denver & Rio Grande locomotive, in which a new valve motion application has been combined with the three-cylinder principle. There is the Baldwin experimental locomotive in which three cylinders, operating compound, are combined with a water-tube firebox boiler, carrying 350 lb. working pressure.

The evidence of this growing appreciation of the value of the locomotive as a producer of horsepower, with its corollary of more efficient utilization of weight and of fuel, are, however, not confined to the steam locomotive types brought together at Atlantic City. For instance, there are the Lima locomotives of A-1 type in which limited cut-off principle of cylinder operation has been combined with a boiler having unusually large grate area and carrying a steam pressure as high as is likely to be practicable with the staybolt type of firebox. This type has demonstrated its ability to increase capacity, both in relation to weight and cylinder dimensions.

Taken together, these developments, while approaching the matter from different standpoints, all demonstrate a rapid decline in the idea that the locomotive can be purchased as so much fabricated metal, at so much per ton.

Today's Program

ONLY one convention will be in session today—Division V, Mechanical, American Railway Association. Members of the Association of Railway Electrical Engineers, which met yesterday at the Hotel Dennis, will be in attendance since both of the reports scheduled for consideration by Division V are of special interest to the electrical engineers.

Mechanical Division

The meeting will be called to order in Convention Hall, on the Million Dollar Pier, at 9.30 a. m., Daylight Saving Time, and will adjourn at 12.30 p.m.

The program follows:

Discussion of Report on:
Electric Rolling Stock.
Locomotive and Car Lighting.

Entertainment

10.30 a. m. Orchestral Concert, Entrance Hall, Million Dollar Pier.
3.30 p. m. Orchestral Concert, Impromptu Dancing, Entrance Hall, Million Dollar Pier.
4.30 p. m. Tea will be served in Entrance Hall.
9.30 p. m. Grand Ball, Ball Room, Million Dollar Pier.

R. S. M. A. Executive Committee Meets Today

A MEETING of the Executive Committee of the Railway Supply Manufacturers' Association will be held in the office of the manager of the Million Dollar Pier, near space No. 3, main building, at 11:30 o'clock a.m. (daylight saving time) Tuesday, June 14. Members elect of the Executive Committee are invited to be present at the meeting.

Lost and Found

SECRETARY John D. Conways' office, of the R. S. M. A., is the clearing house for all lost and found articles.

LOST—Badges 124, 3802, 5007, 5035, 5365, 6143, 8631 and 10706. Also a pair of gloves, a gold purse, a silver mesh bag and a pearl pendant brooch.

FOUND—A flat key No. 60358.

Have You Visited the Motor Exhibit?

THE attention of the convention visitors, especially those who have arrived recently, is again directed to the motor bus and truck exhibit. The exhibit is easy to reach. Go down the Boardwalk two blocks from the Million Dollar Pier. You will there see a sign indicating that you should turn to the right to get to the track and motor exhibits. When you have gone a short distance to the right you will see just beyond the track exhibit a large tent. The motor exhibit is housed in this tent.

Every railway in the country is going to have to decide what it will do about the motor transport situation and this exhibit gives railway officers attending the convention a good opportunity to look over the kind of equipment being put on the market by the motor manufacturers.

Registration Figures

THE registration at four o'clock on Monday afternoon was 7,482. This exceeds the total registration at the last convention by 167. There is still a day-and-a-half to go and it looks as though the total registration this year will exceed 8,000. Already 1,340 Mechanical Division members have registered, which is 116 more than the final total of the last convention. Last year's figures have also been exceeded in the number of Purchases & Stores Division members, supply men and supply ladies. Below is given a comparison for the last four conventions, as of 4:00 p. m. on Monday.

	1920	1922	1924	1926
Division V—Mechanical	805	950	1,143	1,340
Division VI—Purchases and Stores	406	333	365	480
Special Guests	687	800	809	738
Railroad Ladies	746	924	1,075	1,140
Supply Men	2,465	2,285	2,613	3,084
Supply Ladies	660	569	673	700
Totals	5,769	5,861	6,678	7,482

Frisco Gets New Sykes Car

THE first of the new Sykes gasoline rail cars which is being built for the St. Louis-San Francisco by the Sykes Company, St. Louis, will be delivered June 15 and make its first run-in trip June 16. It is planned to leave St. Louis early in the morning and make the round trip to Newburg, Mo., a total of 240 miles, three or four of these trips being made before the car is sent to its destination for schedule service.

The Entertainment Yesterday

YESTERDAY'S social affairs consisted of an orchestral concert in Entrance Hall in the morning, an informal dance, with tea at 4, in the afternoon, and a largely attended informal dance in the evening. At the last named function the guest of honor was J. J. Tatum. A dancing program of 14 numbers was enjoyed. During the three intermissions Lenore Jewel and the six Jewels gave a series of fancy dancing acts, receiving generous applause.

The evening's subcommittee in charge was composed of A. G. Johnson, chairman; S. L. Bateman, C. L. Brown, J. W. Coleman, J. W. Fogg, L. Ingraham, C. R. Naylor, F. O. Schramm, J. H. Van Moss and Irving H. Jones.

New Mediation Board

PRESIDENT Coolidge yesterday appointed four out of five of the members of the new Board of Mediation and Conciliation which was created by the recently passed Watson-Parker railway labor act. The men appointed are former governor Edward P. Morrow, of Kentucky, and G. W. W. Hanger, both of whom were members of the old Railroad Labor Board; Samuel E. Winslow, of Massachusetts, formerly chairman of the House Committee on Interstate and Foreign Commerce, and Hywel Davis, of the Department of Labor. Messrs. Morrow and Hanger were both public representatives on the Railroad Labor Board and it will be recalled that Mr. Hanger was for years a member of the Mediation and Conciliation Board under the Newlands Act.

Semi-Annual Meeting of the Electrical Men

Association of Railway Electrical Engineers Meets at Hotel Dennis and Outlines Work for Fall Convention

THE semi-annual convention of the Association of Railway Electrical Engineers was held on Monday morning in the Ozone Room of the Hotel Dennis. Unfortunately, Ernest Wanamaker, electrical engineer of the Rock Island Lines and president of the association was confined to his room at the Chalfonte Hotel, suffering with eye trouble and was unable to be present to deliver the customary opening address. C. R. Sugg, electrical engineer of the Atlantic Coast Line and vice-president of the association, presided. The meeting was called to order by Mr. Sugg at 10:00 a. m. with an attendance of approximately 75.

The customary report of the secretary-treasurer Joseph A. Andreucetti was not presented, due to the fact that Mr. Andreucetti was unable to attend the convention because of illness. A. G. Oehler, editor of the Railway Electrical Engineer, acting secretary read a letter from Mr. Andreucetti, expressing his regrets at not being able to be present.

The members then proceeded to the consideration of the reports, the first presentation being on the subject of safe installation and maintenance of electrical equipment. This was briefly outlined by George T. Johnson, assistant electrical engineer of the New Haven, chairman of the committee.

Safe Installation and Maintenance of Electrical Equipment

The report of the committee on safe installation and maintenance of electrical equipment was much longer than any of the others and covered the subjects in great detail. In fact the report was so extensive that it would seem that little could be added to make it more complete. The first part covered details of installing electrical wiring, generators, motors, switchboards and control equipment. The second part of the report described the Schaefer or "Phone Pressure" Method of Artificial Respiration, photographs being included to indicate the various steps of procedure in resusitating a person who has suffered an electric shock. The third part, which was the longest section, was undoubtedly the most important one. It covered the subject of grounding of electrical conductors and explained at length the various means of making grounds as well as the relative value of grounds made in different ways. Numerous diagrams and curves explained more clearly than words the various results obtainable by different grounding devices.

Discussion

In the short discussion which followed, the question was asked whether the committee had followed exactly or closely practices outlined by the National Electric Safety Code. It was pointed out that it might be well, in case the committee differed, to reconstruct such portions of the report so that it might harmonize with the National Electric Safety Code.

In reply Mr. Johnson said the committee had looked through all information available and felt that it had followed the practices outlined in the National Electric Safety Code pretty closely.

Report on Loose Leaf Manual

The committee assigned to the compilation of the loose leaf manual which the association is preparing to cover its standard practices, reported that the manual would be ready for distribution within a few weeks. The committee announced that its work for this year would consist of working out the details of the methods to be followed in keeping the manual permanently up-to-date. In this connection, it was stated that each committee should include as part of its regular work each year (a) specific recommendation covering new subject matter that should be added to the manual, (b) recommendation as to what changes, if any, should be made, (c) recommendations as to what obsolete matter should be withdrawn, if any. This Report was presented by L. S. Billau, assistant electrical engineer of the Baltimore and Ohio. There was no discussion.

Report on Illumination

The committee on illumination stated that it had been compiling information showing production of incandescent lamps in train lighting and headlight schedules, segregated as to sizes, voltages, type of bulbs, etc., corresponding to similar data that has been compiled in the past for train lighting lamps and which will now be extended to include lamps for locomotive service.

The subject of floodlighting as applied to railroad classification yards is also being considered, with particular reference to the requirements to be met where the mechanical retarder system of yard operation is used.

Discussion

Mr. Billau, who presented the report, amplified it somewhat; among other things he suggested that it might perhaps be desirable to develop a special lamp for flood light purposes. He also stated that some steps had been taken to place distinguishing marks on the 100-watt headlight lamp used in switching service, so that they can be identified easily from the 250-watt lamp used in road service, but which is in the same size of bulb. Ultimate markings have not been established, however.

Another point in relation to headlight lamps was the possible use of the 100-watt lamp with inside frosting for switching service. Some experiments have been made with this lamp and it has been found to give a fair degree of satisfaction, although tests indicate that the illumination obtained is very close to the margin of requirement. It was stated by one of the representatives of the lamp manufacturers that if the lamp were desired for this service, it would be a simple matter to raise the wattage sufficiently so that the degree of illumination required to meet the specifications could be obtained. In any event, the diffused light from the inside frosted lamp has apparently met with favor with switching crews wherever the lamp has been tried.

Report on Motors and Controls

The report of the committee on motors and controls was brief. It stated that it had been studying the new applications of motors and control equipment with reference to making changes or additions to the report submitted two years ago. The report listed a number of devices that have been developed since the meeting of the association last October and called attention to the fact that the motor specifications of the association would be changed to avoid the necessity of special equipment having to be built for railway service. This report was presented by G. W. Bebout, electrical engineer of the Chesapeake & Ohio. There was no discussion.

Report on Train Lighting

The next report presented was that of the committee on train lighting. Like most of the others it was short and listed a number of things which the committee has been, and is now considering. Some specific recommendations were made concerning size of wire for battery circuits, belt clearances and location of steam drips. Information was requested from roads using rubber covered dynamo pulleys as the committee felt that it should have more data on this subject before making any definite recommendations.

Axle generator axles, and general supporting of generators and pulley centers were also included in the subjects touched upon by the committee. Locomotive train lighting, it was stated, is a subject of increasing interest as applied to suburban and branch line service and the committee is compiling detailed information relative to this system as it is being developed on the different roads.

Discussion

In regard to the question of belt clearance, it was pointed out that the specified clearance should represent the minimum allowable, as it was believed that if more were available the tendency when installing equipment would be to increase rather than decrease clearance.

Radio on Moving Trains

No report on the subject of radio on moving trains was presented, but a letter from Ernest Lunn, chairman of this committee, was read. Mr. Lunn promised a full report on the subject at the annual meeting in Chicago. His letter indicated, however, that most of the subject matter of the report would be in the nature of radio as it affected the traveling public. In contrast with this, P. S. Westcott, formerly chairman of this committee, called attention to the fact that there were possibilities for radio communication between head and rear ends of long freight trains, which might well prove the means of effecting real economics. He cited one instance where an experiment of head and rear end communication on a 73-car train had resulted in saving a full hour in running time in a seven-and-a-half-hour run.

Power Plants

No report was presented on the subject of power plants, but the chairman of the committee made some significant remarks to the effect that railroad power plants had reached a very critical stage when it would soon be necessary to increase their size or abandon them altogether in favor of purchased electrical energy. The meeting then adjourned.

Patent Allowed

C. B. FLINT, senior vice-president of the Paige & Jones Chemical Company, who is attending the convention, received a telegram Saturday morning announcing the he has been granted a patent on his "wayside tank method" of treating water for locomotive boilers.

A Marine Exhibit at the Railroad Conventions

PROBABLY few people in attendance at the railroad conventions realize that the American Car & Foundry Company is in the shipbuilding business, and have been somewhat surprised to learn that part of this company's exhibit is a 47-ft. cabin cruiser, built at the Wilmington plant. This finely appointed craft is located at the City Yacht Dock, near the Atlantic City Yacht Club beyond the inlet, where it is available for inspection.

The boats of this and other types of pleasure craft which are now being built are by no means the first venture of this company in the marine field. The Jackson & Sharp plant at Wilmington has been a builder of ships since the old sailing craft days, and as it was one of the constituents of the American Car & Foundry Company when that corporation was organized, it is evident that the latter has been in the shipbuilding business throughout its life. During the war it built a number of 110-ft. submarine chasers and it is also a builder of heavy dredging machinery. The building of pleasure craft is a comparatively new venture and the first of the 47-ft. type was laid down in October, 1925.

After the convention this craft will proceed to New York under its own power, where it will be delivered to the owner.

New York Railroad Club Outing

JIM DOYLE, vice-president of the Interborough and general chairman of the committee in charge of the New York Railroad Club Outing, which will be held at Travers Island, Thursday, July 8, perfected arrangements for several of the subcommittees of the Outing while spending the week-end at Atlantic City. The chairman of the Golf Committee is W. J. Fripp, general manager, New York Central Lines East; chairman of the Track Meet, W. S. Galloway, purchasing agent, Baltimore & Ohio; chairman of the Transportation Committee, J. A. Droege, general manager, New York, New Haven & Hartford; and the chairman of the Baseball Committee, J. J. Mantell, vice-president, New York Region, Erie. Among other executives functioning on various committees are P. E. Crowley, president, New York Central; W. G. Besler, president, Central Railroad of New Jersey; J. M. Davis, president, Delaware, Lackawanna & Western; Frank Hedley, president, Interborough Rapid Transit Corporation, and G. LeBoutillier, vice-president, Long Island.

A Correction

TWO of the forms published with reports presented at the convention of the Purchases and Stores Division appeared in reports for which they were not intended. The new form proposed for statistical records, published on page 1742 of the June 12 issue of the *Daily*, belongs to the report on Standardization and Specification of Stores Stock, an abstract of which was published in the June 11 issue, page 1635. The table, page 1636, showing the sizes of various materials proposed as standards for use should have been published with the Report on Purchasing Records and Organization in the June 12 issue.

Penn State to Hold Reunion Tonight

ALUMNI and former students of The Pennsylvania State College will assemble at 5.30 this evening in front of Booth 1 (*Railway Age* space). Prof. A. J. Wood, head of the Mechanical Engineering Department at Penn State, will be at the reunion. Approximately 30 alumni and former students attending the convention have registered and it is reported that there are quite a number of others present on the pier who have not as yet signed the book. It is requested that those who have not registered do so sometime today so that the committee can have a complete record of those who expect to attend.

Registration, American Railway Association

Division V—Mechanical

Adams, C. W., M. M., M. C., Ritz
Ahern, W. J., Gen. For., C. & O., Ambassador
Akitt, N. B., Mech. Draft., A. C. L., Breakers
Albers. L. H., Supvr. A. B., N. Y. C., Haddon Hall
Ambrose, W. F., M. M., A. & S.. Princess
Anderson, A. L., Gen. For. Car Dept., L. I.
Armstrong, W. E. F., Insp., B. & O., Eastborn
Attridge, O. H., M. M., Georgia, Royal Palace
Austin, John B., For., Penna.
Babcock, W. G., M. M., N. Y. C., Haddon Hall
Baker, F. E., Shop Supt., B. & Ar., Palm Hall
Baker, Geo. H., Pres., Ry. Educ. Assoc., Gage
Bailda, F. E.; Mech. Supt., N. Y. N. H. & H., Traymore
Baldinger, F. O., M. M., B. & O., Traymore
Baldwin, W. A., V. P., Erie, Dennis
Band, R. W., .Supt. Loco. Maint., B. & M., Dennis
Barnes, W. E., S. M. P., Can. Nat., Ritz
Barrett, C. D., Asst. Eng. of Tests, Penna.
Barton, T. F., Gen. M. M., C. & O., Dennis
Barry, J. L., M. M., N. & W., Marlborough
Battley, E. R., S. M. P., Can. Natl., Haddon Hall
Bauer, T., M. M., C. C. C. & St. L., Ritz
Baumbush, A. J., Gen. For., N. Y. C. & N. Y. N. H. & H., Pennhurst
Benger, .F., Asst. Mech. Eng., C. P. R., Haddon Hall
Bennett, R. G., Gen. S. M. P., Penna., Haddon Hall
Bergmann, P. F., Train—Cont. Inspr., N. Y. N. H. & H., Traymore
Black, R. L., M. M., N. & W., Ritz
Blair, H A., Supvr. F. S. App., B. & O., Haddon Hall
Bodemer, C. J., Asst. Supt. Mchy., L. & N., Marlborough
Boyer, H. A., Asst. Mech. Eng., Erie, Haddon Hall
Boyer, L. K., Gen. Car. For., B. & O., Pennhurst
Branch, Michael, Tool Supvr., C. & O., Traymore
Brandt, C. A., Ch. Eng., Superheater Co., Strand
Brazier, F. W., Asst. to Gen'l. Supt., N. Y. C., Marlborough
Brennan, William F. Gen. For., D. & H., Goodfellow
Brewer, H. W., Supt. Shops, B. R. & P., Ritz
Bronson, C. B., Asst. Insp. Eng., N. Y. C., Haddon Hall
Brower, J. E., M. M., Penna., Gage
Brown, Charles G., Jr., Asst. M. M., Penna., Chalfonte
Brown, Chas. W., Supt., L. & N. E.
Brown, R. M., Asst. S. M. P., N. Y. C., Ritz
Bryant, C. T., Gen. For., C. & O., Ambassador
Buckbee, E. J., M M , C C. C. & St. L., Ritz
Budwell, Leigh, Mech. Eng., R. F. & P., Haddon Hall
Burkley, H. J., M. M., B. & O., Chelsea
Butler, J. S., M. M., Ann Arbor, Dennis
Cain, J. G., Gen. For. Rd. Ho., So., Traymore
Caley, G. H., Elec. Eng., N. Y. O. & W., Ritz
Callahan, P. J., Supvr. Car & Loco. Elec., B. & M., Dennis
Campbell W. L., Asst. to V. P., Erie Dennis
Cantwell, J. L., M. M., So., Rittenhouse
Chalkley, C. R., M. P. Eng., B. & O.
Chapple, J. C., Spec. Eng., K. C. S., Ambassador
Chase, D. K., Asst. M. M., Penna., Dennis
Cheesman, P. M., M. M., Penna., Iroquois
Childs, H E, Asst. M. M., S. I. R. T.
Christy, L. R., M. C. B., Mo. Pac., Chalfonte
Clarke, Arthur B., For., P. & R., Princess
Coddington, H. W., Eng. Tests, N. & W., Marlborough
Coe, T. W. M. M., N. Y. C. & St. L., Knickerbocker
Colbert, J. T., Gen. Supt., P. & S., Marlborough
Colgan, A. H., Asst. G. S. of P., N. Y. N. H. & H., New Iroquois
Colwell, F. G., Supt. of Shops, N. Y. C., & St. L., Ritz
Conahan, C. F., M. M., L. V., Iroquois
Cordic, C. R., Term. For., B. & O., Princess
Cotton, W. A., Mech. Asst., Erie, Marlborough
Craig, E. J., M. M., N. Y. O. & W., Breakers
Crosbie, Geo. C., Spec. Insp., B. & O., Haddon Hall
Cross, D. W., S. M. P. & E., St. L. S. W., Marlborough
Cromwell, E. G., Spec. Insp., B. & O., Haddon Hall
Curran, W. G., Gen. Mgr. N. Y. Term., B. & O., Chalfonte
Davis, A. J., Supt. of Shops, Erie, Princess
Davis, B. F. Sec. to V. P., C. R. R. of N. J.
Davis, D. W., M. M., L. V. Haddon Hall
Davis, J. E., M. M., H. V., Ritz
Davis, M. L., Shop Supt., N. Y. C., Haddon Hall
Davis, W. H., Mech., Eng., N. Y. O. & W., Breakers
Davis, W. R., M. M., Penna., Craig Hall
Deeter, D. H., M. M. P. & R., New England
Delcher, H. C., Insp., B. & O., Elberon
Delleert, W. H., M. M., N. Y. N. H. & H., Windsor
Devaney, T. F., M. M., N. Y. C. & St. L., Traymore
Dillon, Edw. M. M., C. V., Hotel Princess
Ditmore, G. W., M. C. B., D. & H. Marlborough
Dixon, W. J., M. M., B. & O., Elborn
Dodge, J. W., Supt. Fuel Cons., I. C., Chalfonte
Downs, W. R., Supt. of Shops, N. Y. N. H. & H., Chalfonte
Dyke, H. E., M. M., Sou., Traymore
Edmonds, C. G. Special Insp., B. & O.
Egolf, Harry, Ch. Clk., P. & R.
Emery, I., Ch. Eng. Marine Dept., D. L. & W.
Emley, N. B., Supv. T. & M., Erie, Princess
Evans, W. M., M. M., C. & O., Breakers
Fetner, J. H., M. M., So., Rittenhouse
Filer, Jas. Ch. Engr., P. & R.
Foshee, W. D., M. M., S. & A., Knickerbocker
Flynn, L. H., Asst. M. M., N. Y. C., Haddon Hall
Fouse, Frank, Shop Supt., L. V., Haddon Hall
Fraker, J. O., Elec. Eng., T. & P., Flanders
Frances, G. E., Gen. For., Penna., Martinique
Fravel, Geo. B., Asst. Gen. S. M. P., Penna., Dennis
Fries, A. J., Dis. S. M. P., N. Y. C., Chalfonte
Funnell, Walter, Gen. For., N. Y. O. & W., Breakers
Gallagher, John E., R. F. E., P. & R., Sterling
Gardner, Henry, Spec. Eng., B. & O., Chalfonte
Gelhausen, F. R., M. M., B. & O., Traymore
Gillespie, H. C., M. M., C. & O., Ambassador
Grimes, E. F., Ch. Eng. Marine Dept., Lehigh Valley
Grimshaw, F. G., Works Mgr., Penna., Chalfonte
Hanvey C., Spvr., S. A. L., Runnymeade
Hardy, E. C., Asst. Eng. N. Y. C.
Harmison, W. E., M. M., Erie, Knickerbocker
Hawk, E. Thompson, Gen. For., P. & R., Knickerbocker
Helme, C. F., M. M., L. V., Haddon Hall
Henry, C. L., Asst. M. M., Penna.
Hentz, G. J., M. M., N. Y. C., Haddon Hall
Hipkins, C. C., R. F. of Eng., Penna.
Hitch, C. B., M. M., C. & O., Dennis
Hitzel, Harry, Asst. Ch. Engr., P. & R.
Hobson, W. P., M. M., C. & O., Haddon Hall
Hodapp, J. E., Supvr., Loco. Oper., B. & O., Traymore
Hofanman, K. E., Asst. Eng. of Tests, Penna., Villa
Hogan, Chas., Mgr. Shop Dept. of Labor, N. Y. C., Marlborough
Hoke, H. A., Asst. Mech. Eng., Penna.
Houlihan, D. J., Eng. Ho. For. D. L. & W., Knickerbocker
Housholder, A. P., M. M., Mo. Pac., Ritz
Howley, T. F., Supt. Loco. Oper., Erie, Strand
Hudson, T. C., Asst. Gen. Supvr. Mot. Pow., Can. Natl., Shelburne
Hunt, H. B., Mech. Eng., F. E. C., Sterling
Johnson, Frank, S. M. P., So., Haddon Hall
Johnston, W. D., Dist. M. M., B. & O., Ambassador
Jones, E. S., Gen. Car Insp., B. & A., Pennhurst
Jones, R. C., Spec. Eng., N. Y. C.
Jones, V. L., Asst. Mech. Eng., N. Y. N. H. & H., Traymore
Jordan, L. F. Ch. of Bd., Penna. Tank Line Ambassador
Kahler, C. P., E. E., O. S. L. Marlborough
Kane, Jno. F., Asst. M. M., Erie, Princess
Karibo, J. J., M. M., C. C. C. & St. L., Ritz
Keever, C. E., M. M., So., Traymore
Kelly, M. H., For., B. & O., Elberon
Kelley, S. J., M. M., Erie, Traymore
Kendrick, J. P., Supt. of Shop, B. R. & P., Arlington
Kennedy, S. G., M. M., A. C. L., Haddon Hall
Keyes, R. W., Ch. Matl. Insp., N. Y. N. H. & H., Traymore
Kilker, John E., Eng. of Shops., Mo., Pac., Ritz
Kinney, Chas. D., S. M. P., B. C. G. & A., Chalfonte
Kitchin, H. B., Gen. R. F. E., So., Rittenhouse.
Kline, B. W. Asst. M. M., Penna.
Knope, H. C., Sec. to S. M. P., B. & O.
Koehlinger, C. W. H., Mech. Insp., Penna., Penn Alto
Kron, J. A., Gen. E. H. F., D. L. & W., Princess
Kugler, J. S., Supt. Air Brakes, L. V., Stevenson
Kuhn, E. A., Eng. Mot. Pow., N. Y. C. & St. L., Ritz
Kuhn, W. T., S. M. P. T. H. & B.
Lang, W. C., Asst. M. C. B., P. & L. E., Brighton
Lantelme, John P., Air Brake Supvr., L. I., Knickerbocker
Lantelme, Jos. B., For., L. I. Knickerbocker
Leighton, H. L., Shop Supt., B. & M., Dennis
Lentz, W. L., Eng. M. P., N. Y. C., Ritz
Leppla, A. F. Asst. Mech. Eng., C. R. I. & P., Haddon Hall
Linderman, F. A., Div. S. M. P., N. Y. C., Chalfonte
Lipetz, Alphonse I., Con. Eng., A. L. Co., Traymore
Lowe, T. W., Gen. For., Penna.
Lund, G. E., M. M., Erie, Princess

(*Continued on Page* 1839)

Conventionalities

According to the New York World, George A. Gallinger has been given a new title—that of "Rocking Chair" Champion of the Wykagil Golf Club.

C. B. Young, of Jenkins Brothers, is back on the job again. Since last Wednesday, he has been forced to remain in his hotel room on account of a severe cold.

George E. Scott of the American Steel Foundries, who has arrived for the convention, has just recently returned from a trip through various countries of Europe. He and Charles Knickerbocker made the trip together.

This is the first time in many years that George N. Reiley, of the National Tube Company, has been unable to attend the convention. Mr. Reiley served at one time as treasurer of the association and, until this time, has attended practically every meeting that has been held.

The many friends of Albert J. Bell, prominent hotel man of Atlantic City, for many years president of the Atlantic City Hotel Men's Association, have missed him this year. Mr. Bell underwent an operation in New York a month ago and is now convalescing at the home of his brother in New York City.

H. H. Westinghouse, chairman of the Westinghouse Air Brake Company's board of directors, and only surviving brother of the late George Westinghouse, was in attendance at the convention on last Friday. Mr. Westinghouse maintains a very active and detailed interest in the development of all that has to do with improved railroad service.

A. W. Clokey, of the American Arch Company, motored from Chicago with Mrs. Clokey and his daughter Mary in his new Hupp. The family were together at the Traymore for Mr. and Mrs. Clokey's eighteenth wedding anniversary last Thursday, Mrs. Clokey and the daughter leaving the next day for Salisbury, Md., where Mr. Clokey will join them after the convention.

H. D. Webster, engineer of motive power, Bessemer & Lake Erie, is attending the convention accompanied by Mrs. Webster. He is convalescing from a recent operation for goitre. They are planning to stop off on the way home at Bethlehem, Pa., to visit their son Joe, who is studying mechanical engineering at Lehigh University.

LeGrand Parish, who recently retired as active head of the American Arch Company, is greatly missed by his many friends at the convention this year. This is the first one Mr. Parish has missed since he began coming to the conventions some 25 or 30 years ago. This year he was called to his camp at Phelps, Wis., where he is doing considerable development work in preparation for a season of fishing and hunting.

The Whipples (Mr. and Mrs. A. L.) are veteran conventionites. Mrs. Whipple was for several years prominent in the social activities of the ladies. In Saratoga, in 1903, she was initialed as a member of the "How-do-do" committee. She has attended all the conventions, except one, since that time. The Whipples brought to Atlantic City this year their personal "exhibit," namely, A. Ladue, Jr., 21 years; W. Ward, 19; Dorothea, 16, and Richard, 13.

Friends of Richard W. Braden, vice-president of the B. & S. Manufacturing Company, will regret to learn of his death last Sunday evening just as he was preparing to depart for the convention.

Among those who believe strongly in the value of conventions is S. M. Rogers, vice-president of the Elgin, Joliet & Eastern. Mrs. Rogers is with him this year and there are a goodly number of E. J. & E. men here, headed by J. Horrigan, superintendent motive power.

Inadvertently we omitted the names of W. H. Kinney and Harold Gardner among those who attended the dinner commemorating the 25th wedding anniversary of Mr. and Mrs. B. F. Flory and also the birthday party of Miss Eleanor Flory at the Shelburne Hotel the other evening.

Walter O. Teufel, recently appointed assistant master mechanic of the Pennsylvania at Wilmington, Del., arrived yesterday. This is Mr. Teufel's first convention. Owing to a special assignment he was able only to spend one day at the convention.

Miss F. H. Pettee, the St. Augustine, Fla., manager of the Simplex Wire & Cable Company is, to our best knowledge, the only woman that makes direct solicitation of railway business. Miss Pettee has visited railway shops and roundhouses in the south and is particularly interested in this field.

Yesterday might have been called "father and son" day among the railway mechanical engineers. Among the arrivals were S. S. Riegel, mechanical engineer of the Lackawanna and E. A. Kuhn, engineer of motive power for the Nickel Plate. Mr. Riegel is accompanied this year by his son Malcolm S., who is a junior in the mechanical engineering course at Purdue University; Mr. Kuhn is accompanied by his father.

Leroy Kramer has become vice-president of the General American Car Company since he last attended the conventions, having formerly been vice-president of the Symington Company. He is accompanied by Mrs. Kramer. Mr. Kramer is proud of the fact that the General American Car Company recently has built for the Great Northern the largest locomotive tender ever constructed.

Franklin H. Smith, of the Gold Car Heating & Lighting Company, hardly knows how to behave himself this year. He was chairman of the Enrollment Committee at the 1922 and the 1924 conventions and was about the busiest man on the Pier at both those meetings. The task of giving all his energies to representing his company this year is a comparatively simple matter.

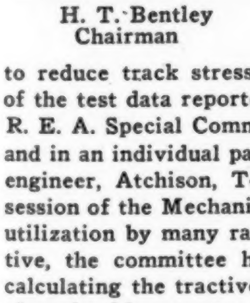
The boiler makers in attendance at the convention this year will be much interested in seeing a moving picture of the Boiler Makers' Convention, which was held in Buffalo last month, at the booth of the McCabe Manufacturing Company. Fred H. McCabe, retiring president of the Boiler Makers Supplymen's Association, conceived the idea of perpetuating the activities of the convention by registering on a movie film the important functions of the occasion. The films show principally the trip to Canada, for which 12 large buses and 40 sedans were used to transport the members of the association. The pictures are remarkably clear. The pictures were taken with Fred McCabe's own amateur movie camera, but the results obtained might well put Fred in the professional class. Hugh E. McCabe, the inventor and designer of the McCabe flanging machine, was here over the weekend with his wife and two sons, Frederick C., 16 years old, and Frank, 11 years old.

Division V Discusses Locomotives

Reports on Locomotive Design and Construction, and on Wheels, Presented at Fourth Mechanical Session

THE first of the final three-day's sessions of the Mechanical Division Convention was opened by Chairman Wallis at 9.30 yesterday morning. After announcements by Secretary Hawthorne the Report of the Committee on Locomotive Design and Construction was presented by Committee Chairman Bentley.

Report on Locomotive Design and Construction



H. T. Bentley
Chairman

The committe's report is divided into six exhibits; standardization of railroad taps and dies, and bolts and screw threads; designing locomotives to reduce track stresses; standardization of water columns; definition of an engine failure; formula for calculating the tractive force of three-cylinder locomotives; and locomotive development, in 1925 and 1926. In Exhibit B the committee has presented a progress report on designing locomotives to reduce track stresses, in which is included an analysis of the test data reported in 1923 by the A. R. A. and the A. R. E. A. Special Committee on Stresses in Railway Tracks, and in an individual paper by C. T. Ripley, chief mechanical engineer, Atchison, Topeka & Santa Fe, read at the 1924 session of the Mechanical Division. Owing to the increased utilization by many railroads of the three-cylinder locomotive, the committee has developed a standard method of calculating the tractive force of such locomotives which is given in this report.

Standardization of Taps and Dies; Bolt and Screw Threads

At the 1925 annual meeting, a report on the standardization of taps and dies used by railroads, and bolt and screw thread standardization, was submitted. This report referred to existing standards and recommended practices of the association, and also comments of the sub-committee and information gathered from various railroads concerning their practices on this subject. A sub-committee was appointed to make a further investigation so that, if possible, final recommendations could be submitted at the 1926 annual meeting, and in this connection we recommend the following be submitted to letter ballot for adoption as recommended practice.

1—The approved form of screw threads as covered in pages L-27 and L-28 of the Manual be changed to read as follows:

"The Sellers or Franklin Institute system (U. S. Standard) of screw threads is the standard of the association, except for pipe work and special locomotive work, in which case other recommended practice or standards which have been adopted by the association should be used."

It is further recommended with reference to page L-28 of the Manual, that the U. S. form of thread be adopted as recommended practice.

2—Referring to page L-21 of the Manual, we recommend that the form or profile of threads for castle nuts be the U. S. standard form, and furthermore, that thin castle nuts, sizes 1⅛ in. to 3½ in., inclusive, be tapped out with eight threads per inch. This is now the standard practice with reference to the thin castle nuts 1⅛ in. to 3 in., inclusive, and nuts of diameters 3¼ in. and 3½ in should be included in it. This has reference to crosshead pins, crank pins, knuckle joint pins, and piston rods.

3—On pages F-67 and F-68 of the Manual, dimensions and number of threads per inch for lubricator fittings do not specify any form of thread for the nuts. We recommend that the Briggs standard straight thread be adopted.

4—On page F-69 of the Manual, the threading of the holding arm does not conform to any recognized system of threading. We recommend that this be the U. S. standard form.

5—With reference to the number of threads and taper for washout plugs, arch tube plugs and all other connections which are directly applied to the boiler, we recommend 12 threads per inch, U. S. standard form, and a taper of ¾ in. in 12 in. be adopted as recommended practice, with the exception of radial crown bolts, taper of which is to be 2 in. in 12 in., and staybolts to have 12 straight threads per inch.

A general conference held in Washington, December 4, 1925, of representatives of manufacturers, distributors, and users of chasers for self-opening and adjustable die heads, with the United States Department of Commerce, through the Bureau of Stand-

ards, recommended that the simplified list of sizes and varieties be established as shown in their report. The recommendations of this committee are to become effective for new production on April 1, 1926. Below are its recommendations insofar as locomotive work is concerned. All chasers not stamped as indicated in the following tables are to be regarded as specials.

TABLE I

American National coarse-thread series				American National fine-thread series			
Size	Threads per in.	Size	Threads per in.	Size	Threads per in.	Size	Threads per in.
* 5	40	9/16	12	8	36	9/16	18
6	32	5/8	11	§10	32	5/8	18
8	32	3/4	10	12	28	3/4	16
†10	24	7/8	9	‖ 1/4	28	7/8	14
12	24	1	8	5/16	24	1	14
‡ 1/4	20	1 1/8	7	3/8	24	1 1/8	12
5/16	18	1 1/4	7	7/16	20	1 1/4	12
3/8	16	1 1/2	6	1/2	20	1 1/2	12
7/16	14	1 3/4	5				
1/2	13	2	4 1/2				

* Identical with size 1/8–40.
† This size should be used in place of size 3/16–24.
‡ This size should be used in place of size 14–20.
§ This size should be used in place of size 3/16–32.
‖ This size should be used in place of size 14–28.

The American National coarse-thread series is the U. S. Standard thread, supplemented in the sizes below 1/4 in. by sizes taken from the standard established by the American Society of Mechanical Engineers. The fine-thread series is composed of standards that have been found necessary and consists of sizes taken from the standards of the Society of Automotive Engineers, and the fine-thread series of the American Society of Mechanical Engineers.

TABLE II—SPECIAL SIZES—TO BE DISCOURAGED
American National, or U. S. form

Size	Threads per in.	Size	Threads per in.
1/4	24	1/4	32
5/16	20	5/16	24
3/8	20	11/16	20
7/16	16	3/4	18
7/16	18	3/4	20
1/2	18	7/8	16
9/16	16	1	16
1 3/8	6	1	20
2	12		

The sizes in Table II do not appear in either the coarse-thread series or the fine-thread series of the report of the National Screw Thread Commission, or in the report of the American Engineering Standards Committee. These sizes, therefore, are not recommended by either organization.

TABLE III—THREADS FOR LIGHTING FIXTURES AND FITTINGS
American National, or U. S. form

Size	Threads per in.
1/4	27
5/16	27
3/8	27
7/16	27
1/2	27
9/16	27
5/8	27
3/4	27
7/8	27
1	27

TABLE IV—RAILWAY SIZES (AMERICAN NATIONAL, OR U. S. FORM)
Straight and taper of 3/4 in. per ft.

Size	Threads per in.	Size	Threads per in.
1/2	12	1	12
9/16	12	1 1/16	12
5/8	12	1 1/8	12
11/16	12	1 3/16	12
3/4	12	1 1/4	12
13/16	12	1 5/16	12
7/8	12	1 3/8	12
15/16	12	1 1/2	12
		1 3/4	12

The sizes in Table IV can be used for special thin adjusting or clamping nuts, and in general machine design.

TABLE V—AMERICAN NATIONAL (BRIGGS) PIPE THREAD
Straight and Taper

Size	Threads per in.	Size	Threads per in.
1/8	27	1	11 1/2
1/4	18	1 1/4	11 1/2
3/8	18	1 1/2	11 1/2
1/2	14	2	11 1/2
3/4	14	2 1/2	8

It was decided at the Washington conference definitely to encourage the use of the U. S. standard form of thread rather than the vee form of thread. It was further brought out that the adoption of the U. S. thread would materially reduce the number of taps and dies, and would bring about a uniformity of practice throughout this country.

In view of the work which has been done by this conference and which is practically the same as we are endeavoring to do in the A. R. A., would it not be more satisfactory and economical, providing it meets the views of the majority of the railroads, to adopt their recommendations as standard for screw and bolt threads?

The report of the sub-committee was signed by Wm. I. Cantley (chairman), Lehigh Valley; W. L. Bean, N. Y., N. H. & H.; M. F. Cox, L. & N., and H. H. Lanning, A. T. & S. F.

Report on Designing Locomotives to Reduce Track Stresses

The sub-committee presents as a progress report the following analysis of the test data reported in 1923 by the A. R. A. and the A. R. E. A. Special Committee on Stresses in Railway Tracks, and an individual paper by C. T. Hipley, chief mechanical engineer, A. T. & S. F., read at the 1924 session of the

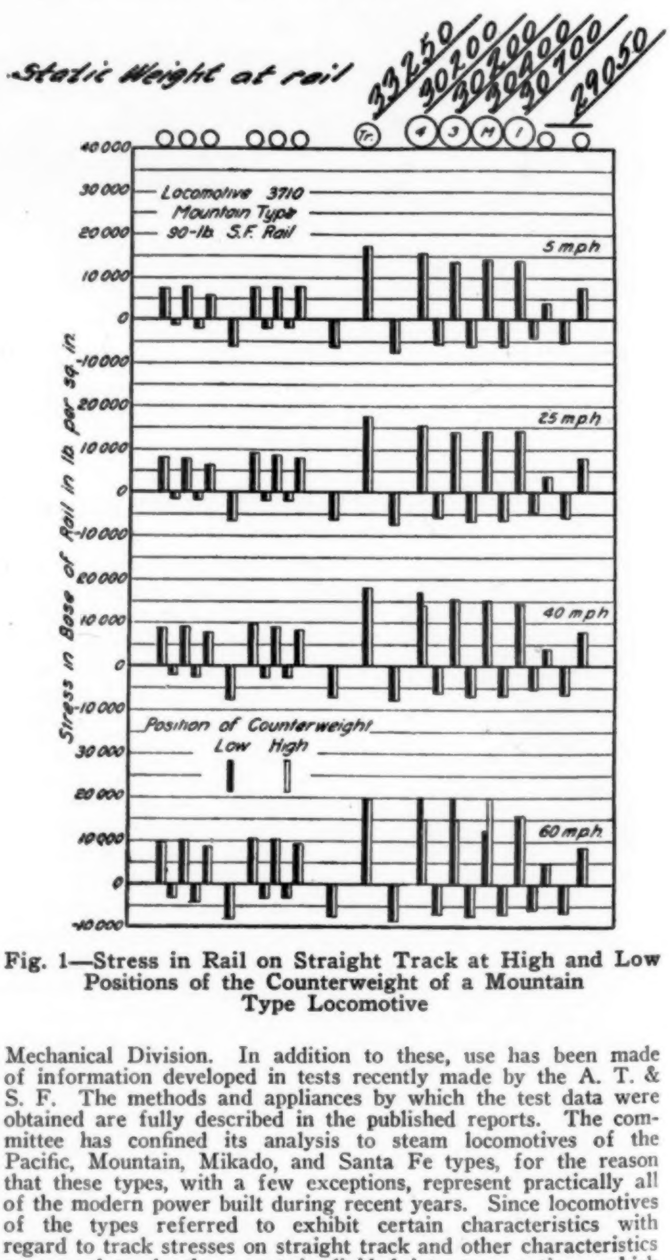


Fig. 1—Stress in Rail on Straight Track at High and Low Positions of the Counterweight of a Mountain Type Locomotive

Mechanical Division. In addition to these, use has been made of information developed in tests recently made by the A. T. & S. F. The methods and appliances by which the test data were obtained are fully described in the published reports. The committee has confined its analysis to steam locomotives of the Pacific, Mountain, Mikado, and Santa Fe types, for the reason that these types, with a few exceptions, represent practically all of the modern power built during recent years. Since locomotives of the types referred to exhibit certain characteristics with regard to track stresses on straight track and other characteristics on curved track, the report is divided into two sections, which consider separately the effects produced in straight and curved track.

EFFECTS ON STRAIGHT TRACK

The test reports show that stresses due to speed effects, exclusive of counterbalance, at 40 to 60 m. p. h., for the various

locomotives tested, range from 15 to 27 per cent. greater than the stresses produced by the same wheels at 5 m. p. h. These increases in rail stress, due to speed, are considered moderate and allowable. However, attention should be given to the length of unloaded rail between wheels, as this has a direct bearing on rail stresses due to speed.

It is desirable to avoid excessive distances between wheels following each other along the same rail, as the data shows that the upward reaction of the rail between wheel contacts produces stresses that bear certain relations to the distance between the points at which the loads are applied. These stresses usually amount to about 50 per cent. of the direct stresses produced by wheel loads, but may become larger if the wheel spacing is unduly increased. These stresses are of considerable importance in the case of a heavily loaded pair of trailer wheels, as there is usually

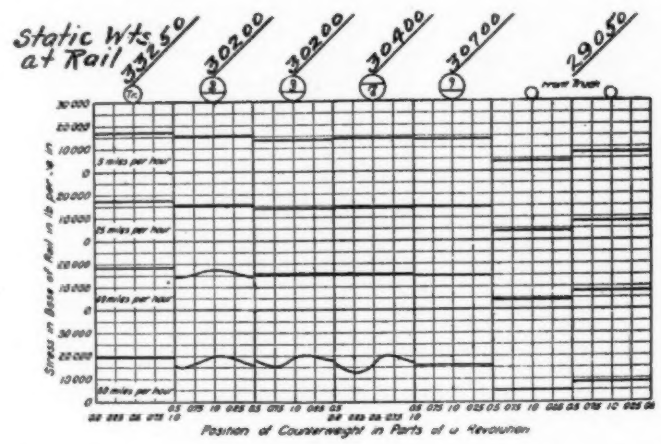


Fig. 2—Curves of Average Stress in Rail on Straight Track Throughout a Revolution of the Drivers of a Mountain Type Locomotive

a considerable distance between the trailer and the rear pair of drivers, which results in an unusually large reaction in the rail between these wheels.

The use of a four-wheel trailer truck, instead of a two-wheel trailer truck, is shown by the test report to have the effect of reducing these reactionary stresses because the length of unloaded rail between the rear driver and trailer is decreased. The four-wheel trailer truck has the further advantage of dividing between four wheels the load that would otherwise be carried on two.

The magnitude of stresses due to speed effects and the relation of these reactionary stresses to the stresses produced by forces applied directly to the rail by the wheels, is clearly shown in Fig. 1, in which the direct stresses are indicated above the datum lines, while the indirect stresses produced by the reaction of the rails between wheels are indicated below the datum lines.

The data indicates that as a rule uniform driving wheel loads

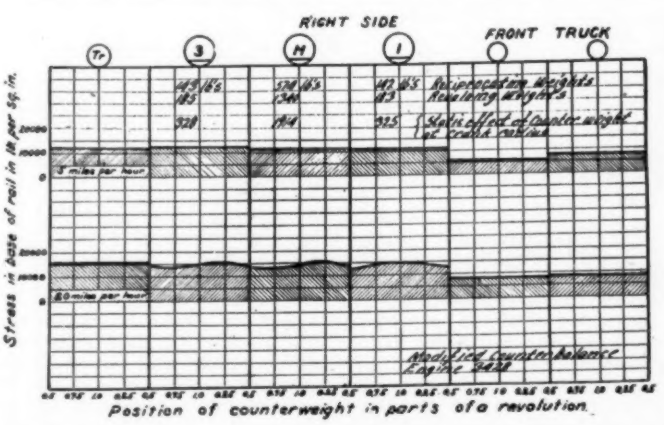


Fig. 3—Curves of Average Stress Throughout a Revolution of the Drivers of a Pacific Type Locomotive After Corrections had been Made to the Counterweight of the Main Drivers

at the rail give satisfactory rail stresses on straight track. It is important, however, that the load carried by a single pair of trailer wheels should not exceed the average driver load. It should be lower than the average driver load, if possible.

Lack of proper counterbalance, particularly in the main driving wheels, is shown to be the cause of the most severe stresses produced in the rails of straight track. Counterbalance effects amounting to more than 100 per cent. of the stresses produced at five miles per hour were observed in connection with one of the locomotives tested. It is also clear, from the data, that few locomotives counterbalanced in accordance with the usual method have sufficient counterweight in the main wheels to counteract properly the centrifugal forces produced at high speeds by the weight of the rods and other parts carried on the main crank pins. This is true, notwithstanding the fact that extra weights to counteract reciprocating forces may have been placed in the counterweight of the main wheels in addition to the weight required to balance the rotating parts according to the static method. This is due to the fact that the centers of gravity of the counterweight and the weights on the main pin do not revolve in the same vertical plane. The results of this condition are shown in the stress diagram, Fig. 2, which shows that at high speeds the stresses under the main wheels are greater when the crank pin is down than when the counterweight is down.

The remedy for this condition lies not only in making the greatest possible use of refinements in design and materials for revolving and reciprocating parts, whereby maximum reduction of weight in these parts may be obtained, but it is also desirable to design the locomotive so as to keep the centers of gravity of these parts as close as possible to the planes in which the counter-

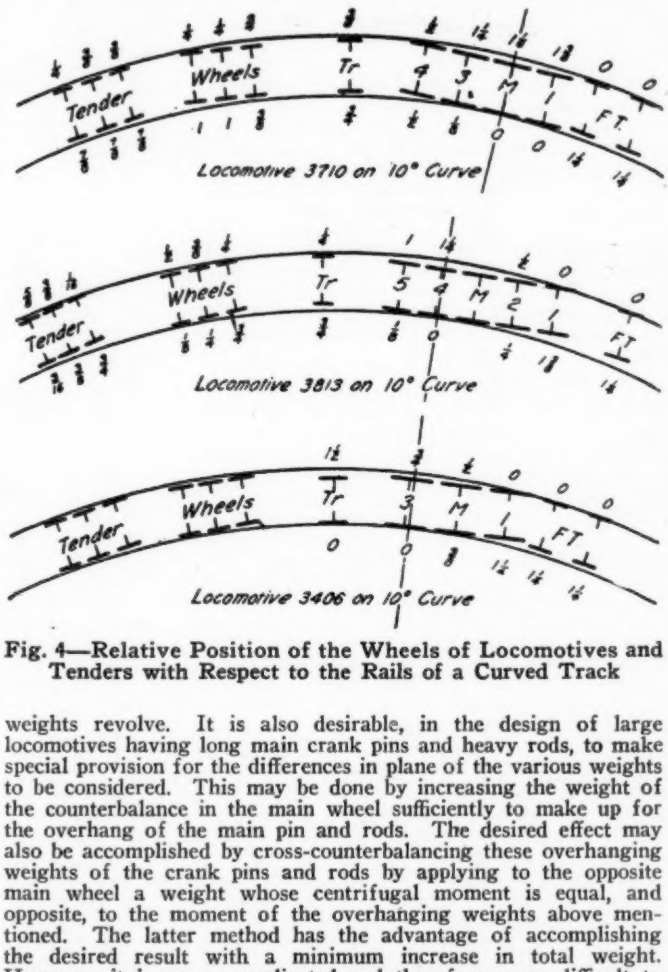


Fig. 4—Relative Position of the Wheels of Locomotives and Tenders with Respect to the Rails of a Curved Track

weights revolve. It is also desirable, in the design of large locomotives having long main crank pins and heavy rods, to make special provision for the differences in plane of the various weights to be considered. This may be done by increasing the weight of the counterbalance in the main wheel sufficiently to make up for the overhang of the main pin and rods. The desired effect may also be accomplished by cross-counterbalancing these overhanging weights of the crank pins and rods by applying to the opposite main wheel a weight whose centrifugal moment is equal, and opposite, to the moment of the overhanging weights above mentioned. The latter method has the advantage of accomplishing the desired result with a minimum increase in total weight. However, it is more complicated and therefore more difficult to handle in the shop.

Fig. 3, shows the counterbalance effects of a Pacific type locomotive before and after correction of the counterweight in the main wheels was made. In the case of this locomotive correction was made by increasing the regular counterweight in the main wheel to compensate for the overhang of the main pin and rods. The additional counterweight required was arrived at experimentally.

The experience of various railroads with lead-filled counterweights shows that the lead frequently becomes loose in the ciunterweight pockets. When this occurs, the constant shifting of the lead in the pockets pulverizes the lead so finely that it escapes through any opening that may exist in the walls of the pocket. In order to guard against loss of counterweight from this cause, the practice of checking the counterbalance of locomotive driving wheels at each stopping of the locomotive is strongly recommended. When filling counterbalance pockets with lead,

extreme care should be exercised to insure the complete removal of all dirt, core sand, etc., as material of this nature crumbles easily and is therefore conducive to loose counterbalance fillings. Lead applied to counterbalance pockets of driving wheels should be equally distributed on either side if the center line of the counterweight, and all spaces in pockets partially filled with lead should be filled with Portland cement, or other suitable material, that will prevent the lead from shifting.

Effects on Curved Track

In order to determine the characteristic positions assumed by various wheels of different types of locomotives with respect to the rails on curved tracks, tests were made by running locomotives onto the curves of the test track and allowing them to come to rest without application of the brakes. Measurements were then taken to determine the relative positions of the wheels and rails, and the results as shown in Fig. 4 are quite interesting. The figures shown at each wheel indicated on the diagrams represent the distance between the gage side of the rail and the flange of the wheel. The radial line appearing in each diagram was struck at right angles to the longitudinal center line of the rigid wheel base, and is believed to locate the pivot point or vertical axis about which the locomotive turns in changing its direction during

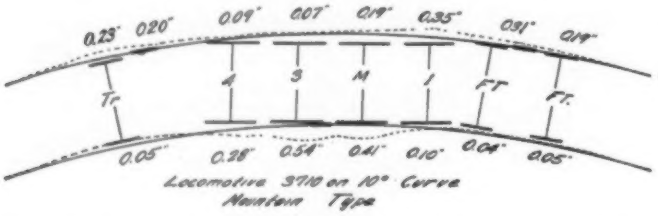


Fig. 5—Characteristic Reflection of the Rails on a 10-deg. Curve with a Mountain Type Locomotive Standing on the Curve—Full Lines show Position of the Rails Under No Load—Dotted Lines show Nature of the Deflection—Figures show Amounts of Deflection Under Each Wheel

its progress around the curve. The pivot point of the locomotive is considered to lie at, or near, the intersection of this radical line with the inner rail of the curve. In the case of a few of the locomotives tested, observations and measurements were taken to determine the amount of lateral deflection from no-load position that was found in the heads of the rails while the locomotive was standing on the curve. Fig. 5 shows the result of these observations for the Mountain type locomotive represented in Fig. 4. This locomotive was designed to have approximately uniform driving wheel loads at the rail. The most important feature to be noted in connection with Fig. 5 is the large deflection of the inside rail that appears under the third driver. Next in importance is the outward deflection of the outside rail under the front driver and trailer. Too much importance should not be attached to the magnitude of the deflection shown, as the diagram represents the results of only a few tests and the deflections of the rails at critical points under the locomotive were clearly affected by the proximity of rail joints as indicated in the diagram. However, the deflections shown are characteristic of the rail distortion that occurred under all of the locomotives tested while moving at low speed around the 10-deg. curves.

The maximum stresses in both the inner and outer rails are shown to be the result of forces tending to deflect the rails outward, away from the center line of the track, and the principal stress produced is therefore one of lateral bending. The test data proves with fair conclusiveness that friction between the tread of the wheel and the top of the rail, rather than direct flange pressure against the rail, is principally responsible for the highest stresses recorded. In the case of the outer rail, the stresses recorded are obviously due to forces and reactions produced in guiding the locomotive around the curve. The reason for the high stress and deflection in the inner rail under the wheel next to the rear driver, is not entirely clear. The most acceptable explanation of this peculiarly high stress is that the point or vertical axis, about which the locomotive rotates in progressively changing its direction on the curve, lies at, or near, the point of contact between this wheel and the rail, and a horizontal twisting effect is therefore imparted to the rail at this point. The nature of the deflection of the rail under this wheel, as recorded in Fig. 5, tends to support this explanation. Further confirmation of this view and proof of the statement that friction, and not flange pressure, is responsible for the high stresses and deflection, is found in the fact that dampness or lubrication on the top face of the rail bring about marked reductions in the stresses.

It appears from the test data that any change of construction or adjustment of parts of the locomotive, which affect the tracking of the different pairs of wheels, or the position assumed by the rigid wheel base with respect to the rails, has the effect of changing the position of this so-called pivot point, and therefore affects the rail stresses produced, particularly the characteristic slow-speed stress in the inside rail under the next to the rear driver. There are a number of features of locomotive construction which appear to have the effect of moving this pivot point. These are length of rigid wheel base, use of plain tires on one or more pairs of driving wheels, lateral play between flanges and rail and between the hubs and boxes, lateral flexibility provided for by hangers or rockers of trucks and driving boxes of the lateral motion type, and length and location of attachments of radius bars of front and rear trucks.

The effects of differences in the length of the rigid wheel base can be clearly observed from the stress diagram.

The use of plain tires on one or more pairs of intermediate driving wheels of a heavy, long wheelbase locomotive, when operating on a curve, has the effect of reducing stresses under the wheels that are equipped with plain tires, but these stresses are usually transferred to an adjacent pair of wheels.

Since friction is shown to be the medium through which serious lateral bending stresses are imparted to the rails under heavy locomotives, it follows that the high stresses that are developed under certain wheels can be reduced by reducing the weight of these wheels and increasing the weights of other wheels, thereby equalizing all of the stresses under the locomotives. Pacific type locomotives appear to give fairly equalized rail stresses on 10-deg. curves when the spring and equalizer rigging is arranged to produce uniform driver loads and the weights of front truck and trailer are each approximately equal to a single driver load.

In view of the results obtained in the test, the following distribution of weights should be given consideration in the design of Mikado, Mountain and Santa Fe type locomotives that are to operate on lines having a maximum curvature of six degrees or more:

Mountain Type

Front pair of wheels, leading truck, approximately one-half average load per pair of drivers.

Back pair of wheels, leading truck, approximately one-half average load per pair of drivers.

First pair drivers 24.6 per cent total weight on drivers.

Second pair drivers 26.2 per cent weight on drivers.

Third pair drivers 24.6 per cent total weight on drivers.

Fourth pair drivers 24.6 per cent total weight on drivers.

Trailer, two-wheel type, not to exceed average load per pair of drivers.

Mikado Type

Front truck approximately one-half average load per pair of drivers.

First pair drivers 24.6 per cent total weight on drivers.

Second pair drivers 26.2 per cent weight on drivers.

Third pair drivers 24.6 per cent total weight on drivers.

Fourth pair drivers 24.6 per cent total weight on drivers.

Trailer, two-wheel type, not to exceed average load per pair of drivers.

Santa Fe Type

Front truck approximately one-half average load per pair of drivers.

First pair drivers 19 per cent total weight on drivers.

Second pair drivers 21 per cent total weight on drivers.

Third pair drivers 22 per cent total weight on drivers.

Fourth pair drivers 19 per cent total weight on drivers.

Fifth pair drivers 19 per cent total weight on drivers.

Trailer, two-wheel type, not to exceed average load per pair of drivers.

If a trailer truck of the four-wheel type is substituted for the two-wheel truck of any of the foregoing wheel arrangements, the combined load at the rail of both pairs of trailer wheels may be approximately one and one-half times the rear driver load. If equal rail stresses are desired under both pairs of trailer wheels, the forward pair of wheels should carry a little more than one-half the total load on the truck. This distribution of weight would, of course, probably not be feasible in the case of a truck of this type that is equipped with a booster operating on the rear pair of wheels only. In this case, the weight on the rear pair of wheels would have to be adjusted to provide the required adhesion and the best arrangement possible under the circumstances would have to be made to prevent undue rail stresses.

A heavy Santa Fe type locomotive belonging to the Southern Pacific, was tested by the A. R. A.-A. R. E. A. Special Committee on a 10-deg. curve. The front drivers of this locomotive

were equipped with the lateral motion driving box and all driving wheels had flange tires. The result of the test showed that this locomotive produced a high stress in the inside rail under the fourth driver that is characteristic of locomotives of this type having uniform driver loads. The stress under the fourth pair of drivers of this locomotive is not quite as high as might be expected of a locomotive without the lateral motion driving box and the stress under the main wheel appeared to have been increased. It is therefore probable that these effects are characteristic of stresses produced under locomotives equipped with lateral motion driving box. However, the influence of the lateral motion driving box is not easily distinguished.

During the past two years there have been developed a number of new features in locomotive construction that are of interest from the standpoint of their effects on the track, and concerning which little, if any, experimental data is available at the present time. The committee has no experimental data for the three cylinder locomotive.

The four-wheel articulated trailer has been developed and a number of these trucks have been put into service. This truck is of particular interest from the standpoint of track stresses, for the reason that it enables the draft arrangement, through which the locomotive pulls its train, to be attached to the driving wheel base close to the pivot point about which the locomotive is said to turn on a curve. This arrangement should reduce the lateral bending stresses that are set up in the rails by a locomotive pulling a heavy train around a curve.

Experimental stress data is also lacking in connection with the locomotive booster. It seems entirely possible that the booster might have some important effects on the rail stresses produced by the trailer wheels and also by the drivers.

The report of the Sub-Committee on Designing Locomotives to Reduce Track Stresses was signed by H. H. Lanning (chairman), A. T. & S. F.; C. E. Brooks, C. N.; A. H. Fetters, U. P.; W. J. Cantley, L. V., and R. M. Brown, N. Y. C.

Report on Standardization of Water Columns

The report of the Sub-committee on the Standardization of Water Columns made the same recommendations as those made last year with the following exceptions:

15—The water column must be equipped with one water glass and three gage cocks which will be spaced not less than three inches center to center, vertically.

21—The water glass, Klinger or Reflex type, top and bottom valve connection to have a bore of ⅜ in. in diameter and the bottom connection must be provided with an outlet located opposite the vertical port. When the side outlet blowout valve connection is used, a cleaning port must be located opposite the vertical port.

22—The water glass, tubular type, bore of top and bottom valve connections into the water column must not be less than ¼ in. and preferably 5/16 in.

23—Water glass vision must not be less than 5 in., preferably 8 in. depending on operating conditions.

26—The water glass must be equipped with a bottom blowout valve and pipe not less than ⅜ in. in diameter. When the side outlet blowout valve and pipe connection is used, a cleaning plug must be located opposite the vertical port.

The report of the Sub-Committee on Standardization of Water Columns was signed by G. H. Emerson (chairman), B. & O.; M. F. Cox, L. & N.; H. T. Bentley, C. & N. W.; S. Zwight, N. P.; A. H. Fetters, U. P., and George McCormick, S. P.

Definition of an Engine Failure

Any delay to a train or reduction of tonnage on account of its locomotive breaking down, running hot, not steaming on account of the condition of the locomotive, en route or at a terminal (after it has been reported ready for service), meeting point or junction connection, will be considered a locomotive failure.

The following will not be considered as locomotive failures:

(a) When a locomotive loses time and afterwards regains it without delay to connections or other traffic.

(b) When a locomotive is delayed from other causes, as well as from its own condition, and makes up as much time as was lost on account of its condition.

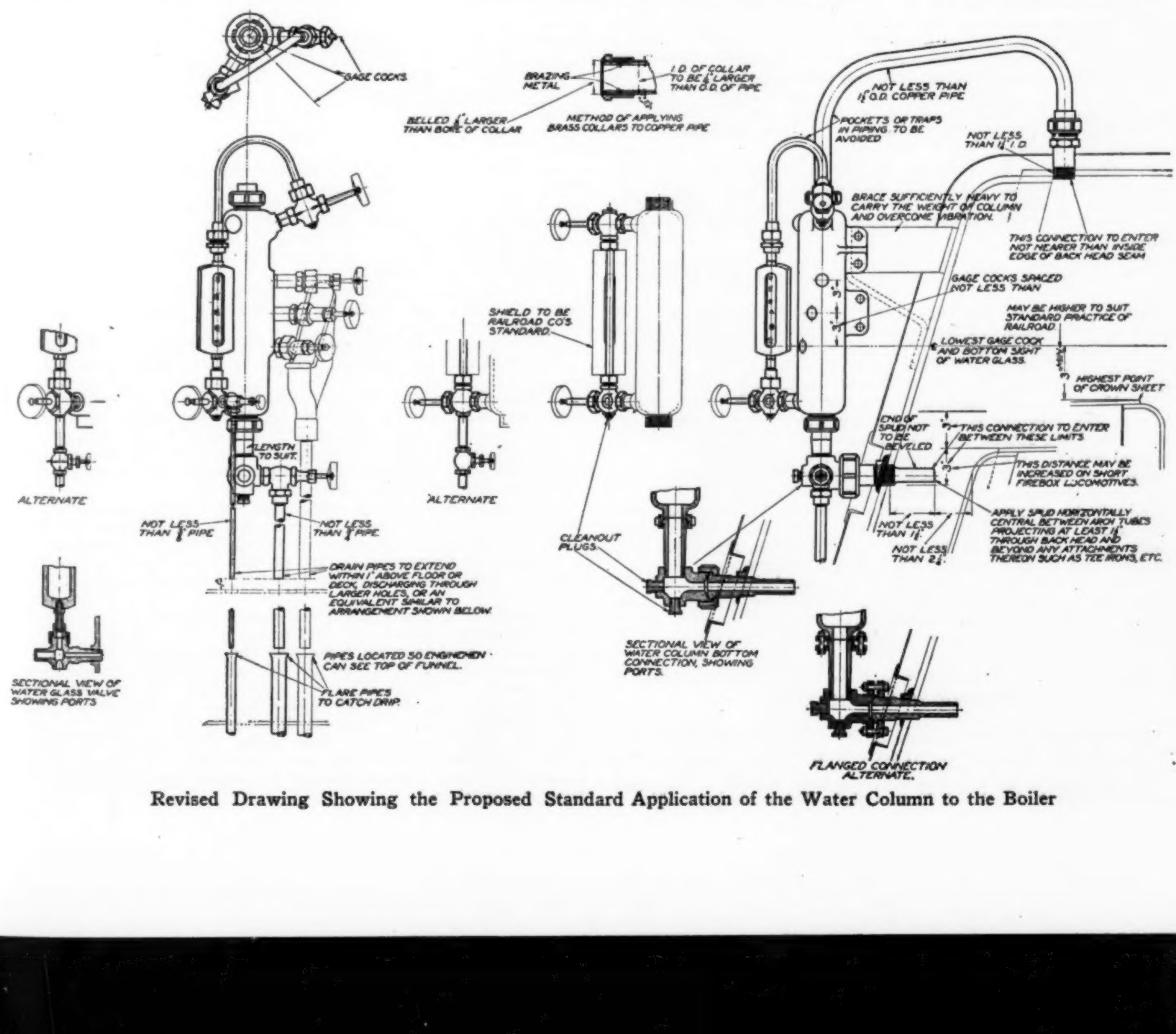
(c) Delays to passenger trains when they are less than five minutes late at terminals or junction points.

(d) Delays to scheduled freight trains when they are less than 20 min. late at terminals or junction points.

(e) Delay when a locomotive is given tonnage in excess of rating and stalls on a grade, providing the locomotive is working satisfactorily.

(f) Delays on extra or non-schedule freight trains if the run is made in less hours than the number of miles divided by ten.

(g) Locomotive steaming poorly or flues leaking on any run where a locomotive has been delayed (for other cause than defects of the locomotive) on side tracks or on road an un-



Revised Drawing Showing the Proposed Standard Application of the Water Column to the Boiler

reasonable length of time or 15 hours or more per 100 miles.

(h) Reasonable delay in cleaning fires and ash pans on the road.

(i) Failure of locomotives coming from outside points to shops for repairs or wash-out, whether running light or hauling train.

(j) Delays due to insufficient time having been allowed in which to make needed repairs or get the locomotive ready for the time the train is ordered to leave, when the operating department was so advised at the time the locomotive was ordered.

(k) Broken draft rigging on the engine or tender, when caused by the train parting or air brakes being otherwise improperly set from the train.

(l) Delays to trains when weather conditions are such that it is impossible to make time, providing the locomotive is working satisfactorily.

(m) Delay due to the locomotive being out of fuel or water, caused by being held between fuel or water stations an unreasonable length of time.

(n) Locomotives running through over two or more divisions with the same locomotive and on the same train, will not be charged with more than one failure on a trip on account of the same defect.

The report of the sub-committee was signed by George McCormick (chairman), S. P.; W. L. Bean, N. Y., N. H. & H.; S. Zwight, N. P.; C. E. Brooks, C. N., and C. B. Young, C. B. & Q.

Formula for Calculating the Tractive Force of Three-Cylinder Locomotives

Assuming that the steam pipes and valves are of the same capacity, the power developed in a cylinder of the same size operating under the same steam pressure and valve condition will be the same irrespective of the number of cylinders with which the locomotive is equipped. Therefore, the tractive force formula for the three-cylinder simple locomotive must be based on the same principle as the formula for the two-cylinder locomotive, taking into account the number and size of the cylinders.

The report of the sub-committee was signed by H. A. Hoke (chairman), Penna.; A. Kearney, N. & W.; C. B. Young, C. B. & Q., and G. McCormick, S. P.

Locomotive Developments—1925-1926

The Sub-committee on Locomotive Developments submits herewith a progress report on the following subjects reported on last year; high pressure and water tube boilers, oil-electric or Diesel locomotives, the three-cylinder locomotive, and manual operation by back pressure and effective pressure methods. While we are not in a position to offer conclusive findings in connection with the first three subjects mentioned, we submit that the experience of the last year has helped to eliminate many troubles and develop valuable information.

In regard to the last item we particularly point to the fact that this method constitutes the first attempt to give the locomotive engineman an idea of the actual results of throttle and reverse lever position with consequent fuel saving at a low initial expenditure.

Higher Boiler Pressure and Water Tube Boilers

One of the most significant developments during the past year is the use of pressures ranging from 250 lb. to 350 lb. in various types of locomotive boilers. There are a large number of locomotive boilers of conventional design in service carrying pressures of 250 lb.—the most notable application being the Pennsylvania, Class 11s. The first important departure from the conventional type at this pressure is the McClellon water tube boiler of the N. Y., N. H. & H., on which we are now able to submit a report of road tests.* We also submit a brief report on the Delaware & Hudson "Horatio Allen," now in regular freight service, and mention the building by the Baldwin Locomotive Works of a three-cylinder compound locomotive having a Brotan type water tube boiler carrying 350 lb. pressure. Test data covering this boiler is not available at the time of writing this report but may be submitted in time for discussion at the convention.

While the service tests of high pressure boilers are not yet conclusive we submit that the general trend of design at least points to the use of the highest pressure possible with single expansion which up to the present has been 250 lb.

The "Horatio Allen"—350 Lb. Pressure Cross-Compound Locomotive

The Delaware & Hudson reports that the "Horatio Allen" has now operated through two winters, with repeated temperatures as low as 15 deg. below zero, and through heavy snows. No trouble has been experienced with the boiler and the limited amount that has occurred is localized in some seven or eight tubes connecting the two drums, and these of the inner row. The basic reason therefore has been conclusively developed and the necessary revision in design, to meet the same, provided.

For the past six months, this locomotive has been operated in the pool in order that the entire operating personnel of the division could become fully conversant with the handling of this type of power. Due to the coal strike, freight movement has been materially reduced, but in a general way the major portion of the crews have handled this locomotive. Consequently, we have had the opportunity of gathering experience under the most adverse operating conditions.

As an outgrowth, specifications have been prepared covering a second locomotive, this to be a forerunner of others, after a limited period of service, to insure that the changes made have been those of advancement. In the main they are; first, increase in operating pressure from 350 to 400 lb.; second, change from Duplex to single throttle; third, better distribution of weight through the locomotive and a reduction of weight in casting designs; fourth, five instead of six rows of tubes between the two drums, and these to be of the one diameter, 2½ in.; fifth, elimination of desaturator; sixth, increase of superheat to 700 plus deg. total temperature.

During the past year, no trouble has been experienced either with cylinder or rod packing.

The trouble had with the pound in the main boxes, mentioned at the last convention, has been solved. There is no evidence of results of quarter-slip, a question raised at the last meeting. But when the locomotive is shopped, it is expected that it will be necessary to turn the tires.

Performance Tests of the "Horatio Allen"

	One road trip	Avg. of 5 road trips
Speed, miles per hour or equivalent	....	15.43
Throttle position	....	....
Duration of run or test, minutes	105	105
Cut-off, per cent	64	63.6
Average boiler pressure, pounds	343	345
Average branch pipe pressure, pounds	325	324
Average branch pipe superheat, degrees	....	....
Pounds coal fired, total	6316	6869.8
Pounds coal fired per square foot grate surface	52.4	57.44
Total water used, pounds	54561	55894
Equivalent evaporation	11.35	10.68
Efficiency of boiler, per cent	80.6	75.8
Average i. hp.	1803	1814.2
Dry coal per i. hp. including auxiliaries, pounds	2.015	2.197
Steam to cylinders and auxiliaries per i. hp.	17.5	17.91
Average drawbar pull	41000	40560
Average drawbar horsepower	1694	1701
Dry coal per drawbar horsepower, pounds	2.14	2.312
Machine efficiency of locomotive	93.8	93.86
Thermal efficiency of locomotive	8.72	8.02

The Oil-Electric or Diesel Locomotive

The practical use of the oil-electric or Diesel locomotive today is indicating the following characteristics:

1—Total elimination of standby losses.

2—A thermal efficiency of approximately four times the steam locomotive in continuous service.

3—An increased utilization which cannot be properly developed, however, until such time as maintenance staffs are better acquainted with the oil engine.

4—The use of full horsepower of the locomotive at all speeds.

The most difficult problems which are now being worked out are:

Cooling—While the cooling problems of the oil engine are much less than of the gasoline engine, the cooling apparatus, surface radiators and fans, must of necessity be the subject of careful design and when combined with the cooling devices for motors are liable to absorb about 8 per cent. of the power of the oil engine under extreme conditions.

Lubrication—Lubricating costs due to over-consumption of lubricating oil and to renewal due to crank case dilution are too high, in some cases almost equalling fuel oil costs. Special study is resulting in material reduction of this figure and it is safe to expect a ratio between fuel oil and lubricating oil costs of 8 to 10 to 1.

Control—This feature might not seem to warrant any particular study but in practice it has caused considerable concern. Tests have shown a close relation between revolutions per minute and horsepower curves developed by the oil engine throughout the speed range of 250 to 750 r. p. m. and in order to reduce the maintenance costs of the oil engine to the best figures possible, full advantage must be taken of this speed range and co-incidentally the electric equipment must follow these curves with sufficient lag in output to permit speed increase of the oil engine to maximum speed without forcing the engine into inefficient oil burning conditions.

* The test data on the McClellon water tube boiler included in this report was published in the March 6, 1926, issue of the *Railway Age*, page 575.

Noise and Vibration—While both these factors are distinctly noticeable to any observer, their importance has been overestimated and it is felt that any disadvantage due to them will disappear without serious trouble.

The Three-Cylinder Locomotive

In last year's report on the three-cylinder locomotive, reference was made to two main features: first, the performance and resulting economies, and second, the necessity of an extended test period to determine what maintenance conditions would be experienced.

Up to the present time the American Locomotive Company have built 62 three-cylinder locomotives; 20 fast passenger, 32 freight and 10 heavy switchers.

The builder's guaranteed claims for the three-cylinder locomotive are: 15 per cent more hauling power than a two-cylinder locomotive of equal weight on drivers; 15 per cent. fuel economy in performing the same work as a two-cylinder locomotive; a possible increase in value of the boiler capacity corresponding to the saving in fuel or in other words, a boiler capacity of 85 per cent. being sufficient where a capacity of 100 per cent. is necessary for the two-cylinder locomotive.

Four railroads that have tested the three-cylinder locomotive have placed repeat orders.

With regard to the maintenance features, a certain measure of trouble has been experienced with two parts; namely, the back end of the inside connecting rod, and the cranked axle. Many different designs of back end of connecting rods have been tried with varying success, but it is now felt that a design has been developed which will meet all service conditions either in slow or high speed work. To date one cranked axle has failed but the builders claim that a careful investigation of results both in America and in England and Germany does not indicate that there will be serious difficulty in perfecting a design to meet the most difficult operating conditions.

We feel that before leaving the consideration of this development we should report that the past year's experience has done much to remove obstacles from the general use of the three-cylinder locomotive and we suggest that this design is of vital interest to any railroad with exacting conditions and relatively low permissible axle loads.

Manual Operation by Back Pressure and Effective Pressure Method

Perhaps one of the most effective movements to improve fuel performance that has been instituted during the past two years by certain railroads through the use of gages indicating back pressure and initial or effective pressure to the engineman. It may appear at first sight that such indications will not mean much to the average engineman, but experience is indicating that on those roads where these devices are in operation there is a marked improvement in fuel performance, in some cases exceeding the results from the more expensive devices which have become universal in application to new locomotives.

It must be appreciated that through the entire era of locomotive development no certain indication has been provided to the engineman to show him just what is the result of reverse lever and throttle position. As a result it appeared to some that eventually this control would have to be automatic in order to get the best results. Without in any way criticizing the use of a straight automatic cut-off control, is it not reasonable to endeavor to secure the best possible operating results by manual control through giving the engineman a direct indication as to what back pressure he is operating with? The direct result should be increased attention to the cut-off so as to reduce the back pressure to the absolute minimum and thus increase the effective pressure.

To meet these requirements certain roads have applied back pressure gages in the cab and pipes to the cylinders. Others are testing out and have applied a later development, a gage which indicates on the same dial the steam pipe pressure, the back pressure, and the resultant effective pressure. Without claiming that this indication can be as accurate as may be obtained by indicator diagrams in a steam test, we maintain that it is a practical indication to the engineman as to what he is doing and how he may obtain the best results, and we wish to submit that reports indicate increased fuel economies on modern power as the direct result of an application which will cost less than $100.00 per locomotive.

As an evidence of what is being accomplished we submit the following extract from a report of member railroad having several hundred locomotives fitted with gages showing back pressure and steam pipe pressure:

"By certain tests that we put on our enginemen from time to time, we estimate that the back pressure gages are conservatively saving us 10 per cent. of our locomotive fuel."

The report of the Sub-committee on Locomotive Development, 1925 and 1926, was signed by C. E. Brooks (chairman), C. N.; W. L. Bean, N. Y., N. H. & H.; W. I. Cantley, L. V.; R. M. Brown, N. Y. C., and A. A. Hoke, Penna.

The report as a whole was signed by H. T. Bentley (chairman), Chicago & North Western; H. A. Hoke (vice-chairman), Pennsylvania; A. Kearney, Norfolk & Western; G. McCormick, Southern Pacific; W. L. Bean, New York, New Haven & Hartford; C. B. Young, Chicago, Burlington & Quincy; M. F. Cox, Louisville & Nashville; W. I. Cantley, Lehigh Valley; C. E. Brooks, Canadian National; G. H. Emerson, Baltimore & Ohio; H. H. Lanning, Atchison, Topeka & Santa Fe; A. H. Fetters, Union Pacific; S. Zwight, Northern Pacific, and R. M. Brown, New York Central.

Discussion

E. E. Chapman (A. T. & S. F.): In the report just read recommendation is made with reference to page L-28 of the Manual, that the U. S. form of thread be adopted as recommended practice. This item refers specifically to the staybolt threads.

The locomotive builders use the Whitworth thread for staybolts unless otherwise specified in individual railroad specifications and this type of thread is standard on several large railroads on this continent.

A staybolt while acting as a staying unit must have the properties to a large degree of resisting vibratory or bending action caused by the changing movements of different parts of the boiler as the boiler is worked in various capacities and conditions. Therefore, it is very important that the thread be of a design which will have as full fillets at the root of the thread as is consistent with the pitch of the thread.

Tests have been made that indicate that a considerable reduction in concentrated load at the root of the thread can be made by the use of as large fillets as possible. The use of fillets, while of not so great an importance in

Three-Cylinder Locomotives Now in Service

Road	No. of engs.	Type	Kind of valve gear	Link block, top or bottom	Double or single ported valves	Reverse gear	Drifting valves	Date first locomotive shipped
L. V.	1	4-8-2	Walschaert	Top	Double	Alco	B & S	10-27-23
L. V.	5	4-8-2	Walschaert	Top	Double	Alco	B & S	1-9-25
L. & N.	1	2-8-2	Walschaert	Top	Single	Alco	....	10-18-24
L. & N.	1	4-6-2	Walschaert	Bottom	Single	Alco	B & S	4-1-25
D. L. & W.	2	4-8-2	Baker	....	Double	Alco	B & S	4-1-25
D. L. & W.	3	4-8-2	Walschaert	Bottom	Double	Alco	B & S	9-4-25
Mo. Pac.	1	2-8-2	Baker	....	Single	Alco	....	2-2-25
Mo. Pac.	1	4-6-2	Walschaert	Top	Single	Alco	B & S	1-9-25
C. R. I. & P.	1	4-6-2	Walschaert	Top	Double	Alco	Rly. Co.'s std.	11-17-24
N. Y., N. H. & H.	10	0-8-0	Walschaert	Top	Single	Alco	....	11-11-24
So. Pac.	1	4-10-2	Walschaert	Bottom	Double	Alco	....	4-21-25
So. Pac.	15	4-10-2	Walschaert	Bottom	Double	Alco	....	4-21-25
Wabash	5	2-8-2	Walschaert	Bottom	Single	Alco	B & S	3-16-25
U. P.	1	4-10-2	Walschaert	Top	Double	Precision	....	4-30-25
So. Manch.	5	2-8-2	Walschaert	Top	Single	Alco	Manually	6-4-24
I. G. Ry. of J.	6	4-6-2	Walschaert	Bottom	Single	Alco	operated	....
N. Y. C.	1	4-8-2	Walschaert	Bottom	Double	Alco	B & S	9-13-22
N. Y. C.	1	4-8-2	Walschaert	Bottom	Double	Alco	B & S	1-11-24
U. P.	1	4-12-2 S-495	Walschaert	Bottom	Single	Precision	....	3-21-26
N. Y. N. H. & H.	3	4-8-2 S-367	....	....	......	....	....	....

wrought iron, assumes a greater necessity as the use of steel staybolts is increased.

The U. S. thread dies or taps when used a few times gradually assume the contour of a Whitworth thread. This means that the corners of the root of the thread are dulled and start dragging the metal and do not produce threads in as good condition as though the Whitworth thread was originally used, but would probably produce a better staybolt to withstand bending or vibratory action than with threads having sharp corners on each side at the root of the thread of the perfect U. S. Standard thread.

The report on American Standard Screw Threads approved by the American Engineering Standards Committee in May, 1924, show on page 12 of their report the rounding tendency at the root of threads due to the wear of threading tools. It is, therefore, considered that the committee has not made sufficient investigations to warrant the elimination of Whitworth threads as a recognized practice on boiler staybolts.

E. L. Grimm (N. P.): The first recommendation of the subcommittee on Bolt and Screw Thread Standardization is that changes to be made on pages L-27 and L-28 of the Manual. The report does not state how much of the text on page L-27 it is proposed to eliminate, but presumably the revised paragraph offered is intended to take the place of the first paragraph only, the balance of the text to remain as now. In this connection it should be noted that the present paragraph states that the Sellers or Franklin Institute system of screw threads, *bolt heads and nuts* is the standard of the Association. The proposed paragraph omits any reference to the bolt heads and nuts. As the dimensions of bolt heads and nuts are given in the recommended practice specifications for bolts and nuts page A-33 of the Manual this omission may not be material.

The recommendation with reference to page L-28 that the U. S. form of thread be adopted as recommended practice is not clear, as the U. S. form is now the standard as covered by page L-27. However, page L-28 as now printed is misleading in that it gives the impression that the V, Whitworth, and Sellers threads illustrated are all standards of the Association, although the fact is that the diagrams on this page are merely explanatory of the text on page L-27 and are referred to therein. To make this clear there should be added at the bottom of page L-27 a note reading substantially as follows: "For diagrams Figs. 11 to 16 see Page L-28." Also the heading "Screw Threads, Standard, Adopted 1872; revised, 1882," should be omitted from page L-28 and the diagrams should be raised nearer the top of the page so it will be evident that they go with the subject matter of the preceding page.

The recommendation that the U. S. form of thread be specified on page L-21 for castle nuts appears proper so as to harmonize with the standard.

The change in number of threads per inch from 6 to 8 for thin castle nuts of 3¼ in. and 3½ in. sizes also appears desirable.

The use of the Briggs standard straight thread for lubricator fittings, pages F-67 and F-68, should be satisfactory as this is the form of thread usually used for that purpose.

The U. S. Form of thread for the lubricator holding arm, page F-69, should be satisfactory.

The use of the U. S. form of threads for washout plugs and staybolts may be the subject of some discussion as the V and Whitworth forms are still used to a considerable extent.

We believe that the change from either the V or Whitworth to the U. S. form of threads can be made without serious inconvenience or cost as taps and dies are replaced.

For small bolts and screw threads the adoption of the sizes shown in Tables 1, 3, 4 and 5 appears to be a move in the right direction.

Track Stresses

Mr. Grimm: The report of the subcommittee on Designing Locomotives to Reduce Track Stresses furnishes definite information on the stresses set up in straight and curved track by Pacific, Mountain, Mikado and Sante Fe types of locomotives and indicates that considerable progress has been made in the study of this important subject.

The effect of deficiency of counterbalance, usually existing in the main drivers of so many locomotives, has been indicated and proven conclusively. Whether this lack of effective counterbalance has been due to a shortage in actual weights used for counterbalancing the revolving weights are the method used in determining the counterbalance has been, in the past, more or less of an open question. However, the results obtained on the A. T. & S. F. with a Pacific type locomotive having a modified counterbalance indicates that the different planes in which the counterbalance and the revolving weights are moving should be taken into account and cross counterbalancing investigated further.

The effect of the long rigid wheel base with large diameter drivers and the length of unloaded rail between the rear drivers and the trailer, on many two wheel trailer truck locomotives, points to the fact that this subject has in many designs in the past not been given the serious consideration that it warrants. In a new design of a heavy passenger locomotive the Northern Pacific had to resort to a 4-8-4 wheel arrangement, in order to provide a suitable trailer truck to carry the large firebox required. It is expected that the use of this four-wheel trailer truck will reduce the stresses in the rail below what they would be with the use of a two-wheel trailer.

Water Columns

Mr. Grimm: The report of the subcommittee on Standardization of Water Columns shows that considerable thought has been given toward the development of a column that will embody the best features evolved from the experience of the various railroads.

Naturally, in a matter of this kind, the experience of all roads will not be alike and there will undoubtedly be a difference of opinion as to the best design or arrangement of certain details. However, in general, a water column of the design shown should give satisfactory service. In a number of the details alternate designs are shown which will permit any road to select the combination that it feels will give the best service.

The recommendations definitely limit the location of the bottom spud to within 3 in. above or 3 in. below the back end of firebox crownsheet. The drawing, however, shows a note which permits the distance below the crownsheet to be increased on short firebox locomotives. In order to make the text harmonize with the drawing it would seem advisable to add a clause to the sentence in paragraph 9 reading as follows; "except that the distance below the crown sheet may be increased on short firebox locomotives." Paragraph 9 does not permit the spud to extend to 2¼ in. from the firebox door sheet but the drawing does permit it to extend to 2¼ in. but not less. The text can be clarified if made to read as follows: "Inner end of spud must not extend to less than 2¼ in. from firebox door sheet and must be located in a vertical range between 3 in. below and 3 in. above the back end of fire-

box crown sheet, except that the distance below the crown-sheet may be increased on short firebox locomotives."

These changes are minor but may avoid the possibility of conflicting interpretations.

Definition of an Engine Failure

G. Goodwin (C. R. I. & P.): When an engine or train is operating over two or more engine districts, some times it is the practice not to charge a failure provided the train is brought to the end of that operating division on time. There might have been a serious failure on the first engine district and so it was necessary to change the engine, but there was no failure charged. That ought to be corrected so that when an engine fails it ought to be recorded as an engine failure; otherwise the mechanical department has no check on the comparative performance on different divisions.

G. McCormick (S. P.): This report is not intended to encourage the mechanical department in not keeping up with engine failures. The idea of trying to define a failure is to compare one railroad with another. Our service is dependent upon getting trains into terminals on time. If you had a derailment and got your train in on time you would not report it. The efficiency of one railroad as compared with another is its ability to get trains to terminals on time.

S. Zwight (N. P.): The primary purpose of inaugurating and tabulating engine failure statistics is to provide a means of securing reliable information on locomotive performance that will indicate improper design or improper maintenance practices.

It follows, therefore, that through the medium of such statistics, improper design can be corrected and a comparison of performance on various operating districts will reveal to all officers the particular district or territory where the locomotive maintenance is below standard.

An engine failure report and statement, fairly and equitably compiled in accordance with the rules governing, acts as an incentive for enginemen, shopmen and others to put forth their best efforts so to maintain and operate locomotives as to avoid engine failures, thereby making a good showing compared with other districts or other roads with which standard of operation and maintenance is usually compared.

Imposing too rigid a definition of an engine failure not only discourages officers, but also maintenance and operating forces, from bettering their performance, while on the other hand too lenient an interpretation tends toward making officers careless and indifferent with consequent lowering of maintenance standards.

A comparison of engine failure statistics of one road with another is valueless unless all roads place the same interpretation on engine failures and adopt and apply the same definition in determining them.

E. L. Grimm (N. P.): The proposed formula for tractive force of three-cylinder simple locomotives is developed from the same basis as the formula for two-cylinder simple locomotives. That is a quite logical development and appears correct.

A table of constants is given to take care of locomotives with limited cutoff, both with and without auxiliary ports. In this table the constant is .85 for a 90 per cent maximum cutoff locomotive without auxiliary parts. This is the constant in general use for those conditions. If the constants in the balance of the table have been developed from reliable test data there should be no objection to their adoption.

Locomotive Development

Mr. Grimm: The resume of locomotive development during 1925 and 1926 covers quite thoroughly the major improvements in locomotive design that have resulted in savings in the fuel cost of operation.

Stationary power plant experience has proven quite conclusively the advantages and increased efficiencies that are being obtained by the use of higher boiler pressures and higher superheat and the power companies have not been slow in capitalizating on this knowledge.

After all, a locomotive is merely a combination of a boiler plant and two or more steam engines, with suitable connection between the engines and the rail to produce transportation. The locomotive and the stationary power plant differ principally in the limitations imposed upon the locomotive by the service to which it is subjected. Locomotive designers have not yet developed a means of securing the large furnace volume, preheated air for combustion and many other refinements which produce known savings in fuel and are practically standards of design steam pressures and temperatures which produce such good results in stationary service, can be obtained in the locomotive and the results secured on several railroads in this country indicate that this will be a promising field for development.

The development of the oil-electric or Diesel locomotive is only in the experimental stage and no doubt at the present time sufficient detailed data covering operating advantages and disadvantages and comparative economies are not obtainable.

The relative merits of the three-cylinder locomotive were outlined in considerable detail at the 1924 and 1925 conventions and the discussions then were quite spirited. The report of this committee substantiates in a general way the major points of vital interest brought out at that time and lists the various railroads that now have locomotives of this type.

The application of instruments which will enable the engineer to control manually the cutoff so as to secure the most efficient operation has been much neglected. The report of the committee indicates that this will be a profitable field for future development. It does not seem that it would be a difficult task to educate and inspire the enginemen to interpret properly the readings of the instruments and apply this knowledge to the correct operation of their locomotives.

J. Purcell (A. T. & S. F.): I would like to have some information on the three-cylinder engine from some one who has a sufficient number in service a sufficient length of time to tell us where the crank axles are giving out.

C. E. Brooks (C. N.): In our investigation with the builders we understood that it was the pin that broke in the crank axle.

Mr. Brooks: Mr. Grimm made mention of the use of high pressure and pointed out that stationary plants were showing us the way and that the features in connection with the use of high pressure in stationary work had not yet been applied to locomotive practice. I think Mr. Grimm has probably forgotten our report of last year on the Ljungstrum locomotive. On the Ljungstrum locomotive practically all the features of stationary high-pressure practice have been applied; pre-heated air and water, moderately high-pressure steam and the use of the turbine, as well as the service condenser. When it comes to stating that the achievements have been comparable with those in high-class stationary practice, that is another question because we know that in stationary practice you can not obtain the desired efficiency without getting a vaccum of 28¾ to 29¼ in. The Ljungstrum locomotive as observed was not able to do this and under maximum operating conditions when developing continuously the

highest rated horsepower the vacuum fell down to a point where the condenser, as a piece of efficient equipment, almost disappeared. In other words, the vacuum went down to 12 or 14 in.

G. Greenough (Baldwin Loco. Wks.): Is is not a fact that the Pennsylvania I1S engine has shown under test a higher rate of efficiency for coal consumption per horsepower than either of the engines noted in the report?

W. F. Kisel, Jr. (Penna): We made tests on the I1S and also on the three-cylinder engine and the coal per indicated horsepower for the I1S was considerably better than for the three-cylinder engine.

Mr. McCormick: May I ask Mr. Kiesel a question? Were you comparing one of your 50 per cent cut-off engines with the 85 per cent three-cylinder engine?

Mr. Kiesel: Yes, I was.

Mr. McCormick: I will say for the benefit of the convention that our locomotives are designed with a 70 per cent cut-off. You will notice in the report that it is claimed that three-cylinder locomotives have saved 15 per cent in fuel and hauled 15 per cent more tonnage. Our actual performance indicates that those figures are correct —over a period of nearly a year it is a little better than those figures.

Mr. Kiesel: You did not qualify that fact because you will find those figures are compared with the 50 per cent cut-off engine.

A. P. Prendergast (T. & P.): The committee requests information on a track stress test that we are now making with our 2-10-4, 4-8-2 and 2-10-2 type locomotives. We have figures to show that the four-wheel trailing truck is much more flexible than the two-wheel trailing truck on these two classes of freight locomotives.

I have the following report on the performance of our 2-10-4 locomotives which may be of interest:

Operation of 2-10-4 Locomotives on T. & P.

During the month of November, 1925, 10 locomotives of the Texas type were delivered to the Texas & Pacific by the Lima Locomotive Works. These locomotives have the 2-10-4 wheel arrangement and the whole design was the result of careful study and observation of all classes of power on several different railways, the idea being to combine the best features to produce a locomotive that would be suitable for all classes of freight service on the T. & P. and also to be able to provide with this locomotive the maximum starting drawbar pull, the maximum capacity at speeds, the best fuel economy and still remain within our limits of 60,000 lb. per pair of driving wheels.

With the idea of meeting these specific requirements, we decided to use a 10-coupled locomotive incorporating the features which were built into these locomotives.

A brief description of the 2-10-4 type locomotives with corresponding figures for the former 2-10-2 type follows:

Type	2-10-2 Type	2-10-4 Type
Cylinders	28 in. by 32 in.	29 in. by 32 in.
Boiler pressure	200 lb.	250 lb.
Maximum cut-off	90 per cent	60 per cent
Diam. of drivers	63 in.	63 in.
Tractive Force (Cyls.)	67,700 lb.	83,000 lb.
Tractive Force with booster	None	96,000 lb.
Weight on drivers	267,500 lb.	300,000 lb.
Factor of adhesion	4.07	3.61
Fuel	Oil	Oil
Firebox area	70 sq. ft.	100 sq. ft.
Evaporative heating surface	3792 sq. ft.	5113 sq. ft.
Superheater	Type "A"	Type "E"
Feedwater heater	None	Elesco
Syphons	None	Nicholson

The above combination of factors in the Texas type locomotives makes possible a great increase in boiler capacity which is reflected directly upon cylinder hauling capacity, as well as a noticable economy in fuel and water.

Our railroad, in common with most roads of the country, has been trying to get locomotives that would produce the greatest possible pulling capacity within wheel load limits. With only a slight increase in the weight on drivers this locomotive, when compared with the 2-10-2 type shown in the table above, makes available 44 per cent more drawbar pull at starting, 50 per cent more drawbar pull at 20 m.p.h., and 50 per cent more at 40 m.p.h.

As a result of the increased power of these locomotives the following operating results have been obtained. The first table gives the report of the operating and fuel departments, as far as they concern the Texas type, for the month of May, 1926, and compared with the performance over the same territories for May, 1925. It must be remembered when considering the figures in the first table that there are still some of the old 2-10-2 types working on the divisions with the Texas types so that the figures will show only the influence of the Texas type and not their true worth.

Division Service	Train	Miles	Av. Tons per mile		Gals. oil per 1000 Gross T.M.		Av. Speed mi p. h.	
	1926	1925	1926	1925	1926	1925	1926	1925
Eastbound								
Dallas (Through	20755	14501	2106	1984	8.4	9.8	16.0	14.6
Ft. Worth Frt.)	15506	13675	2061	1614	6.5	10.5	20.1	17.5
Baird	9971	8447	2153	1650	6.0	10.0	16.7	15.0
Westbound								
Dallas (Through	14237	16491	1967	1822	10.3	11.4	14.8	15.3
Ft. Worth Frt.)	10486	12398	2057	1588	9.1	14.2	18.4	17.4
Baird	9670	8390	2153	2060	8.9	10.4	14.1	13.9

The fuel departments record of individual locomotive performance for the first three months of 1926 show the following comparison with the 2-10-2 type:

Increased Tonnage	44 per cent
Increased Train Speed	33 per cent
Decreased Fuel (per 1000 g. t. m.)	42 per cent

It will be of interest to you that the straight line or extended main rods upon these locomotives have been responsible for greatly increased mileage of rod bushings and reduced costs of rod maintenance.

H. D. Webster (B. & L. E.): Has the subcommittee given any consideration to the possibilities of compounding the three-cylinder locomotive?

Mr. Greenough: Engine No. 60,000, which is on exhibit was only completed a few weeks before this convention opened and has been run only for a number of trips on the B. & O. It is our expectation to put it back on the road as soon as it is released here and later we are hoping to have an opportunity to have it tested on the Pennsylvania testing plant which will tell definitely whether or not we have been justified in trying to go one step in advance and compound the three-cylinder engine.

If you will recall, the thing has been done in England with more or less success, but the engines were smaller and conditions very different—it is really a new problem which has to be solved with regard to American railroad practice.

Another feature of the engine which has not been brought out in the report is that we have endeavored to do away with staybolts entirely in this locomotive. The locomotive, in the middle section, is a normal engine. At the front end we are experimenting with the cylinders compounded, at the back end with the water tube firebox without staybolts.

Lima 2-8-4 Type Locomotive

F. A. Butler (B. & A.): As the committee has called attention to the development of the 2-8-4 type locomotive, it may be of interest to the members to know the actual performance of locomotives of this type built by the Lima Locomotive Works and used in fast freight service on the Boston & Albany.

Twenty-five of these locomotives have been in service on this road since March, 1926. These locomotives have 28 in. by 30 in. cylinders, 240 lb. working pressure with

a maximum limited cut-off of 60 per cent, 63 in. diameter drivers and a tractive force from the main engine cylinders of 69,400 lb. The tractive force available with the booster included is 81,400 lb.

The fire-box is of the radial stayed type, 96¼ in. wide by 150⅛ in. long with a grate area of 100 sq. ft. This large grate area tends to reduce the rate of combustion and road tests with a dynamometer car show that, while a maximum rate of 6,623 lb. of dry coal per hour was attained, the average rate for dry coal per square foot of grate per hour was only 52.7 lb. The heating surface of the boiler is 5,110 sq. ft.,—that of the firebox being 284 sq. ft., the arch tubes 53 sq. ft., the tubes 1,055 sq. ft., and the flues 3,718 sq. ft. The superheating surface is 2,111 sq. ft. which makes a combined evaporating and superheating surface 7,221 sq. ft.

The evaporation per pound of coal is unusually high and an equivalent evaporation of 11.97 lb. per hour per pound of dry coal was obtained in tests made. The large fire-box heating surface combined with the heating surface of the five 3½ in. diameter arch tubes contributes to the desired result of high boiler efficiency and we have found that the average boiler efficiency is 80.5 per cent. These locomotives are equipped with type E superheaters and it is found that the average degree of superheat is about 209 deg. Fahr.

The four wheel articulated trailing truck has given very satisfactory results. This type of truck steadies the riding and the locomotive accomodates itself to the sharp curves readily and is unusually flexible.

Tests were made of the 2-8-4 type locomotive over a division having an up grade of approximately 1 per cent for a distance of 50 miles. The average speed was slightly more than 16 m. p. h. and the average cut-off 43.7 per cent. The maximum indicated horsepower was 3,133 at a speed of 20 m. p. h., with a cut-off of 60 per cent. In the series of tests referred to the lowest water rate excluding auxilliaries was 18.6 lb. per indicated horsepower per hour or 21.4 lb. including auxilliaries. Greater horsepower and lower water rates have been obtained on level track.

To compare the operating results affected by the introduction of the Berkshire type locomotive we have taken the average gross ton miles per train hour on the division for May 1, 1925, as compared with May 1, 1926, both days being typical days, with the following results. On May 1, 1925, one Mallet, nine Consolidated and four heavy Mikados produced an average gross ton mile figure per train hour of 18,400. On May 1, 1926, ten of the Berkshire type locomotives produced 26,050 gross ton miles per train hour. This represents an increase in the capacity of the railroad of 42 per cent when using the Berkshire type locomotives.

[A full description of this 2-8-4 or Berkshire type locomotive was given in the *Railway Age*, May 2, 1925 and the result of the road tests in the issue of September 12, 1925. The data given by Mr. Butler has consequently been abbreviated.—Editor.]

J. Snowden Bell: It seems to me that there is one point in the report which has not been sufficiently stressed,—the elimination of staybolts in the water-tube firebox. That is one of the greatest advantages of the system.

Mr. Lipetz (A. L. Co.): There are several figures which have been mentioned—Mr. Greenough referring to the coal consumption said that his recollections were that the Altoona tests proved coal consumption below two pounds. It is given in the report as an average of 2.312. It is quite true that the Altoona tests showed in certain cases consumptions of two pounds and below, but they were occasional tests under constant and very favorable conditions. Here are tests—average tests of road trips which of course can not be compared with the Altoona stationary plant tests.

If you take the average of all the figures which the Altoona test plant showed of a certain engine, you will note average figures higher than those which are given here.

In regard to Mr. Kiesel's remark about the 50 per cent limited cut-off figures. If you look at the formula "T" for tractive force you will see that a new member is added, and, due to this new member, the coefficient "K" can be made less. If you further look to the values of "K" in the table below, you see when you want to get a lower "K" you could use a lower cut-off, so that the three-cylinder principle is just in line with the limited cut-off principle.

When you get the tractive force for the I 1 S engine with two cylinders having limited cut-off, the Pennsylvania resorted to 31½-in. cylinders. The Union Pacific, if I am not mistaken, have 27-in. cylinders. Now, this means reduced piston thrust, also due to reduced boiler pressure, about 25 lb. as compared to 250 lb. on the I 1 S, and consequently lesser wearing of pins and cost of maintenance.

A motion to accept the report was made and carried.

The Election of Officers

The tellers announced the following results of the election: Chairman, L. K. Sillcox, general superintendent motive power, Chicago, Milwaukee & St. Paul; vice-chairmen, G. E. Smart, chief of car equipment, Canadian National Railways. Members of the General Committee, terms expiring June, 1928, C. E. Chambers, superintendent motive power and equipment, Central Railroad of New Jersey; C. F. Giles, superintendent machinery, Louisville & Nashville; E. B. Hall, superintendent motive power, Chicago & Northwestern; A. Kearney, Superintendent motive power. Norfolk & Western; J. E. O'Brien, chief of motive power and equipment, Seaboard Air Line; John Purcell, assistant to vice-president, Atchinson, Topeka & Santa Fe; J. T. Wallis, chief of motive power, Pennsylvania. Member of General Committee, term expiring June, 1927, S. Zwight, general mechanical superintendent, Northern Pacific. Immediately following the election Chairman Wallis, after a few appropriate remarks, turned the gavel over to the incoming chairman, Mr. Sillcox.

Report of Committee on Wheels

C. T. Ripley
Chairman

The committee reports that it is testing out on various roads several types of wrought steel wheels which embody special processes of manufacture recently developed by the manufacturers. These include wheels with rims given a water treatment process, wheels with tread surface cold rolled and manganese steel wheels. Another new development is the light "one-wear" steel wheel for freight cars of which a considerable number have already been placed in service throughout the country.

Cast iron wheels made with lip chiller and those with a reinforcement ring plate, to which reference was made in last year's report, are still being tested out with favorable results. Single-plate cast iron wheels have been developed in four sizes and a considerable number have already been placed in service. This design bids fair to be a great improvement in cast iron wheels. Revision of specifications for cast iron wheels is carried over for another year.

A new drawing of a wheel mounting gage is submitted and changes recommended in the wheel mounting pressure tables. Changes are also recommended in the hub requirements of the wrought steel wheel specifications. It is suggested that the practice of grinding slid-flat cast iron wheels now followed on some roads, be made a recommended practice. A discussion of brake-burned wheels is accompanied by a series of photographs. The committee also has gone over the wheel shop practice manual submitted last year and has recommended a number of changes.

As a result of the work of the Technical Committee of the Wrought Steel Wheel Manufacturers an extensive study has been made of possible changes to overcome the shelling trouble. A number of tests of steel wheels made by special processes are now under way on various railroads.

Developments in Wrought Steel Wheels

The special processes are as follows: (1) Turning off of 3/8 in. or more of tread metal of wheels by manufacturer. (Data available indicated that the majority of the shelling occurred on the first run of the wheels.) (2) Water treatment process of rim of wheels. (3) Manganese steel wheels. (4) Wheels with tread surface cold rolled. All these tests are of such recent date that no figures are yet available but it is believed that the tests are so comprehensive that the information resulting will enable the manufacturers to make further advance in the quality of their product.

Another development in steel wheels is that of the so-called one wear steel wheel. This wheel has only about ½ in. of service metal in the tread and the plate and hub are also lighter than the multiple wear wheel. The proposal of the manufacturers is that this wheel be used only in freight cars with journals not over 5½ in. by 10 in., and scrapped after its one period of service. The relative advantages of this wheel as compared with the multiple wear are claimed to be a matter of cost and the individual roads must work this out from their own service results. We understand that one road has applied a large number of these wheels. The code of rules was revised to provide for the use of this wheel in interchange It was impossible to handle the billing on the same basis as the multiple wear wheel, and it was, therefore, considered the same as other single wear wheels; that is, a new value, a secondhand value and a scrapping value were assigned. It was made to come under provisions of the remount gage to avoid the billing of practically worn out wheels as secondhand. Furthermore for protection of the multiple wear wheel users the rules provide that the one wear wheel cannot be applied in place of the multiple wear type, although multiple wear wrought steel wheels may be applied in replacement of the one wear wheels. See Fig. 1.

The technical committee of the Wrought Steel Wheel Manufacturers has submitted a specification for the one wear steel wheel with the statement that these wheels are being manufactured by one company only. The wheel committee is not satisfied with these specifications as the tolerances are rather liberal and requirements as to finish are not what they should be. If these wheels come into general use it will probably be necessary to submit to the Association specifications governing their manufacture.

Developments in Cast Iron Wheel Design

In last year's report attention was called to three developments in cast iron wheel design: the lip chiller, the reinforcement ring plate and the single plate. Tests of these three features during the past year are showing interesting results.

Wheels made with the lip chiller, which eliminates the sand

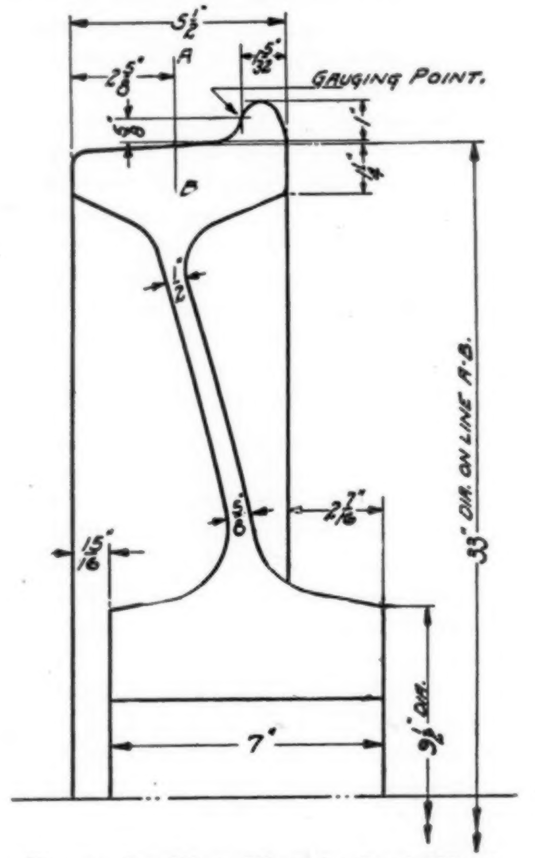


Fig. 1—One-Wear Wrought Steel Wheel

rim, have come into general use and all reports indicate that they are effective in reducing the number of wheels condemned for chipped rim. Small pieces do chip or cut out of these rims, due to striking special frogs, etc., but they seldom develop the long leaf-like fractures which are such a common cause of condemning wheels. Some trouble has been experienced by the foundries, due to getting a somewhat deeper chill at the outside of the rim when lip chillers are used. It does not appear that this is a particular drawback as there is no danger to the wheel involved. It is felt that the lip chill wheel will prove a considerable saving.

About 18 months ago 1,000 reinforcement ring plate wheels were placed in service on refrigerator cars on one road. Only one has developed a broken plate and in this case the break stayed inside of the ring instead of going out through the rim and thus derailment was avoided. This would indicate that the rings were a helpful feature of design, due to their collection of impurities in the metal. However, the single plate design apparently takes care of this same defect in a still better manner.

The development which promises the greatest improvement is the single plate. Fig. 2 shows such a design superimposed on a standard double plate type. The elimination of the pan-core seems to give much cleaner metal in the plate and the thicker plate, resulting from the concentration of the metal in the plate due to the elimination of the brackets, appears to make the wheel much better able to withstand the stresses produced by brake shoe heat. A considerable number of thermal tests have been

made and these wheels appear to stand this test much better than the standard A. R. A. design. Reports from roads which have

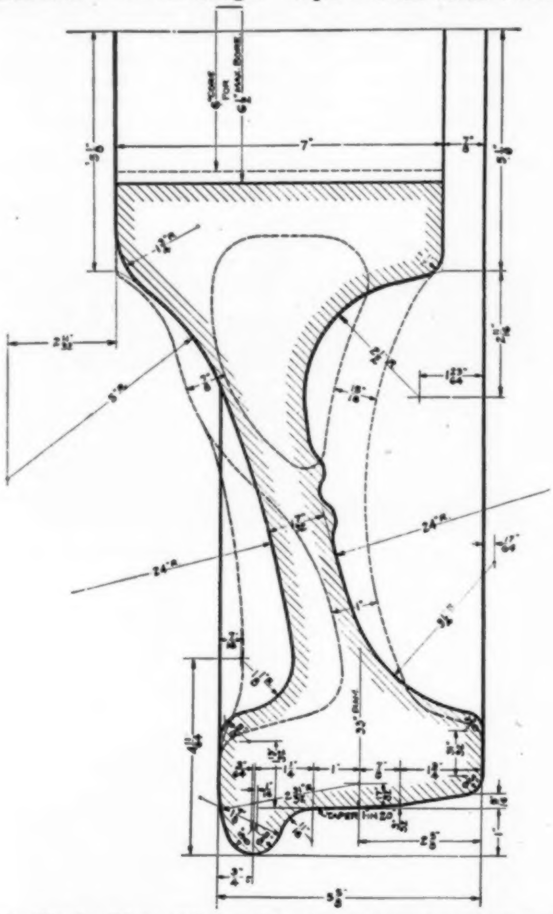


Fig. 2—Single Plate 700-lb. Cast Iron Wheel with Reinforcement Rings

been testing out the 850-lb. single plate wheel in tender service, indicate very satisfactory service. So far as the committee is informed there have been no cases of cracked plates. The manufacturers have now developed the 650-lb., the 700-lb., and 750-lb. single plate design. One thousand of these wheels have been placed in refrigerator car service by one road and data as to their performance should be available in another year. These wheels are up to standard A. R. A. weight and meet all specification requirement but the manufacturers are not putting them out generally but only for test as authorized by the General Committee. It is proper to mark these wheels A. R. A. just as wheels with special tread and flange contours may be marked A. R. A., but the letter "X" is placed after the A. R. A. to denote that they are experimental designs.

Cast Iron Wheel Specifications

It was the intention to give consideration to the revision of the cast iron wheel specifications, and it was the plan of the manufacturers to make a series of recommendations to the committee, particularly as regards the chemical specifications and increase in the thermal tests. Due to the lack of time these recommendations were not received and the subject will be carried over for next year.

Grinding of Wheels

Considerable interest has been shown by various railroads during the past year in the grinding of slid-flat cast iron wheels but so far as known no large grinders have been installed. Some controversy has developed as to interchange billing for secondhand wheels which have been ground. The committee was asked to give an opinion and they reported to the Arbitration Committee as follows: "The Wheel Committee feels that the only specification necessary on reground wheels to make them proper for billing as secondhand is that they cannot be condemned by the remount gage and that the wheels have been ground in a type of machine which grinds the entire circumference of the wheel truly concentric with the journal." The experience of the committee in witnessing and checking the grinding of cast iron wheels causes it to look favorably upon this procedure and they can see no reason why a reground wheel is not equal to the average secondhand wheel and as a matter of fact they are ordinarily superior because they are truly round and the tread is free from heat checks. With proper grinding machine practice, only the best wheels are selected for grinding.

During the past year a number of portable grinding machines have been put in service. These machines, which are mounted on the journal of the axle, merely lengthen out the flat spot by grinding off the edges. Your committee feels that this is an undesirable practice as it leaves the wheel out of round which is detrimental, both to track and equipment. The only proper procedure is to grind the entire circumference.

The committee wishes again to make recommendation that the railroads give more consideration to the installation of grinding

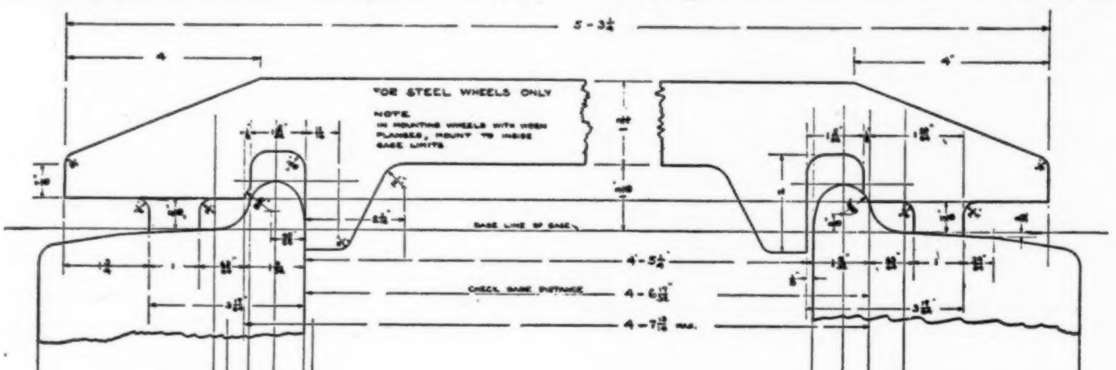


Fig. 3—Improved Steel Wheel Mounting Gage

machines of the proper type for reclaiming slid-flat cast iron wheels. The possibilities of savings have been fully demonstrated. Advantage has also been shown of the practice of grinding new cast iron wheels after mounting, in order to secure rotundity. Savings are also possible in the grinding of slid-flat steel wheels. It is recommended that the grinding of slid-flat cast iron, cast steel and one wear wrought steel wheels in the types of grinding machines which grind the entire circumference of the wheel concentric with the journal be made the recommended practice of the association.

Wheel Mounting Gage

In last year's report a drawing was shown of a suggested gage for mounting steel wheels. After further study the Committee has come to the conclusion that it would be better to have the back to back of flange measurement on the gage 4 ft. 5¼ in. instead of the 5 ft. 5 3/32 in. shown. The I. C. C. maximum limit on tank wheels is 4 ft. 5⅛ in. The committee has, therefore, prepared another sketch which is shown in Fig. 3, making this change. It is still felt that the proper way to mount steel wheels is to use the back to back basic measurement. This is particularly necessary where the road follows the practice of dismounting worn flange wheels and re-mating with other worn flange wheels in order to save tread metal of mate wheels.

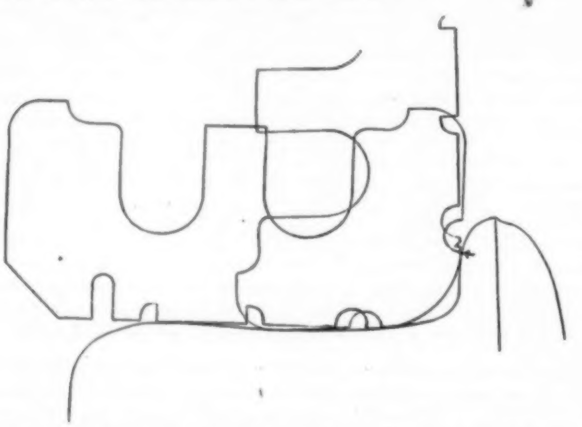


Fig. 4—Sketch Difference in Flange Measurement when Gage is Used Horizontally and Vertically

The standard A. R. A. gage for mounting cast iron wheels has been subjected to much criticism because of the difficulty in using it in mounting two maximum flange wheels or wheels where the tread wear results in maximum flange. Difficulty is also experienced because of the inadaptability of the gage for use on reinforced flange wheels which are being used by a number of roads. It appears that it is the practice on some of these roads to cut 1/32 in. off the flange face bearing surface at each end of the gage in order to make the gage serviceable on this type of wheel. When such wheels are applied under a foreign car and the owning road attempts to check the mounting with their standard gage they naturally find that the wheels are not properly mounted. This is a situation which should be corrected. The suggestion has been made that the standard gage be changed by cutting 1/32 in. off at both ends as mentioned above. From a track viewpoint this seems desirable as the mounting of the wheels closer to the rail should produce less rail wear and it may also be desirable from a flange wear viewpoint. This is a subject of such importance that a careful study of all features involved is necessary and no definite recommendations are made at this time.

Gaging of Chipped Rim Cast Iron Wheels

One of the commonest causes for condemnation of cast iron wheels is the chipped rim, Rule No. 78. There appears to be a general misunderstanding of this rule, and wheels are being condemned under it which are absolutely safe for operation. For example there may be a small surface flake which falls within the 3¾-in. limit. Such wheels should be allowed to run. Generally speaking the defect should come under the gage for a length of at least 2½ in., although there may be exceptional cases of heavy breaks which are not this long and yet require condemnation. The committee recommends that the inspectors be instructed to use more judgment in handling this defect.

Loose Wheels

A number of reports have been made in regard to wheels found with indications of being loose on the axle but which, when put in the dismounting press, showed proper pressure in fit. Indications referred to were the showing of oil working out at the inside of the fit. This condition is undoubtedly causing a considerable amount of unnecessary wheel work and most of it can be avoided if proper material is used for covering the wheel seat when the wheels are mounted. The trouble is that some wheel shops are using a thin oil or paint thinned down with light oil. The proper material is a mixture of white lead and linseed oil. Part of this poor workmanship may be found in the wheel shops of the car manufacturers as there seems to be a lack of understanding of the importance of using a proper material for covering the axle wheel seats when wheels are mounted. It is important that all roads check this matter and put a stop to the practice which is resulting in additional trouble and expense.

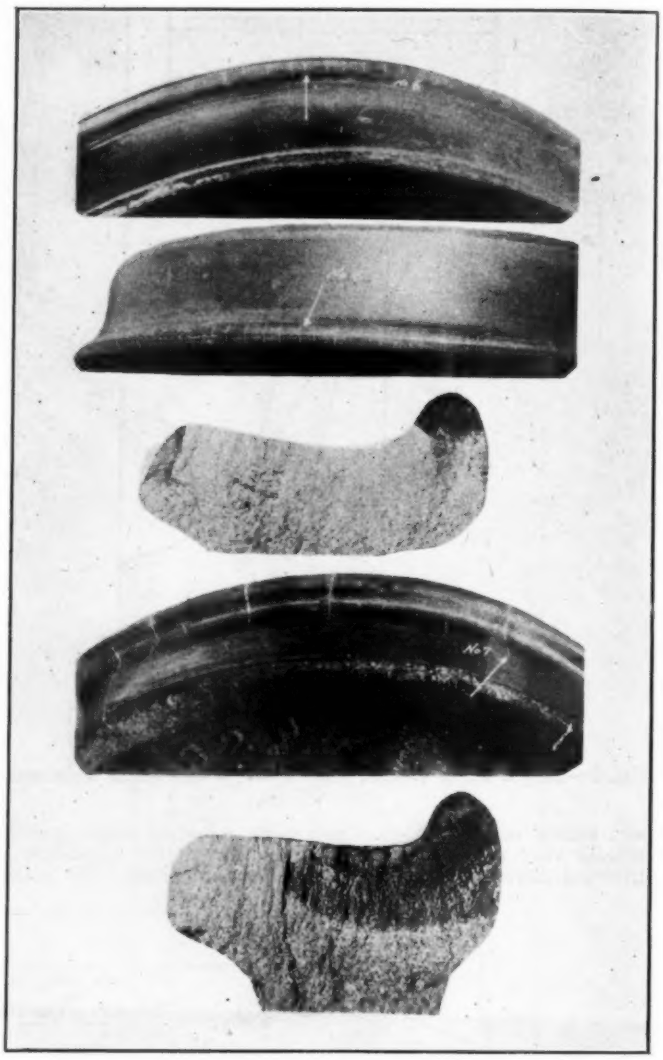


Fig. 5—Flange Liable to Break Out—Should be Condemned

Vertical Flange Defect

A large number of cast iron wheels are condemned under the vertical flange Rule No. 74. Many of these are not truly condemnable when the gage is properly applied. In order to take the gage the flange must come in contact with the limit point of the gage and not, as some inspectors interpret it, merely have a flat surface in the limit height. Furthermore the gage when used to measure the ⅞-in. vertical limit gives in some cases an incorrect result, due to cocking of the gage in the worn tread of the wheel. This is shown in Fig. 4. To overcome this a notch may be cut in the long side of the gage at a ⅞-in. height. The gage can then be applied as shown, on its narrow edge which will overcome the effect of the hollowness of the tread and will not interfere with the use of the present notch at 1 in.

The general purpose of the vertical flange rule is to prevent wheels running which may split a switch. The thin flange rule takes care of safety as regards breakage of the flange. Under these considerations there is a doubt as to whether the ⅞-in. limit is a fair one on the cast iron wheels, for there is no more reason why a cast iron wheel will split a switch than any other type of wheel. However, it does not appear practicable to recom-

mend any change in the rule at the present time. It is recommended, however, that the gaging be properly handled.

Brake Burned Wheels

Rule 71 which covers brake burned cast iron wheels has resulted in much controversy. As written, the rule does not prescribe the degree of brake burn which will be condemnable. Practically all cast iron wheels on types of cars such as refrigerators which get heavy braking service develop some degree of brake burn. The checking or cracking is due to the inability of the chilled iron to expand under the heat produced, either by the brake shoe or skidding on the rail. It has been suggested that this defect be made a delivering line defect. This, however, would be a mistake as it would result in a wholesale removal of wheels which are safe to run. Because of it being strictly a judgment defect this wholesale condemnation would be necessary to protect the line receiving the car. A large percentage of wheels in service have at least some degree of this checking or cracking.

Generally speaking, too many wheels are removed from service for this defect. Investigation of failed cast iron wheels on some roads over a period of a number of years fails to show that this defect is in any way responsible for broken wheels. The break may ultimately pass through one of these checks but this is merely a coincidence. The break starts in the plate and works out to the rim and not from the rim to the plate. The so called skid burn is the source of most of the improper condemnation under Rule 71. The skid burned wheel can, in practically all instances be left in service until the metal falls out of the tread, developing a comby condition detrimental to track and equipment. In order to illustrate the general conditions found photographs were taken of typical cases, showing both the tread surface and the tread cross-section and the committee makes the following comments on these illustrations:

Fig. 6—Burned in Tread only—Danger Questionable

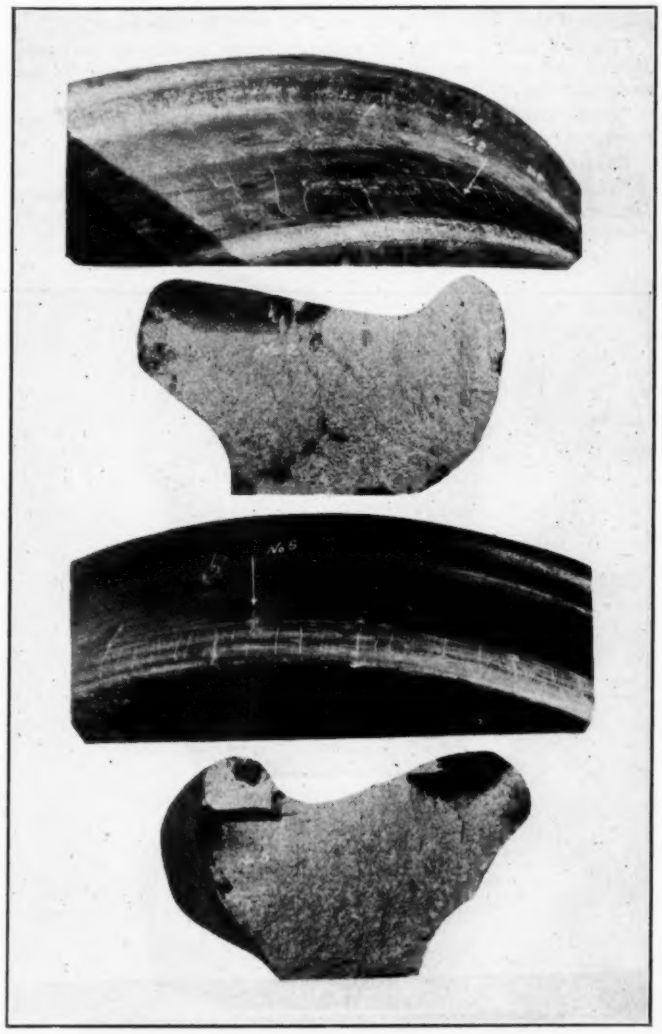


Fig. 7—Checks on Outside Edge of Tread—Considered Serviceable

Fig. 5 shows a wheel in which the brake burn checks run through the flange only. This was probably caused by flange brake shoes. This is in the opinion of the committee a condemnable wheel as pieces of the flange are liable to break out. This type of wheel should be condemned by inspectors. The general practice is to avoid the use of flange brake shoes, but there is possibly some service where this is a necessity.

Fig. 6 shows wheels in which the brake burn lines are in the tread only. They are evidently the result of heavy brake shoe application. The lines do not reach the throat of the flange, though in some cases they run to the outside edge of the rim. This is the type of wheel which is removed under Rule 71 by most inspectors, and though there is a question as to the actual danger involved under the proposed interpretation of the rule given below these wheels would be condemned. These are extreme cases of this particular class of brake burn.

Fig. 7 illustrates wheels where the thermal checks are on the outside edge of the tread. This is usually caused by brake shoes bearing on this portion of the tread only. These wheels are sometimes condemned by inspectors but in the opinion of the committee these wheels are suitable to be continued in service.

Fig. 8 illustrates a wheel which has checks in the tread which are produced by skidding of the wheel rather than by brake shoe heat. There is no reason why this type of wheel should not be continued in service.

Fig. 9 shows two wheels, the upper one of which is just beginning to develop combiness from themal checks. The lower wheel has developed a condemnable comby condition. The comby wheel has to be removed from service on account of the damage to track and equipment rather than damage to the wheel. The shelled-spot rule would be applied to this type of defect; that is, the wheels should not be removed while nothing but the thermal checks are in existence, but should be left in service until comby spots of condemnable limits develop.

Generally speaking the length of the brake burn check or crack is a fairly good indication of its depth. The committee suggests that an interpretation of the rule be put in the code as follows:

Q.—What degree of brake burn is condemnable.

A.—Wheel should be condemned if the checks or cracks extend into the throat of the flange or are in the flange or, when in the tread, are over 2¾ in. in length. Skid burned wheels should ordinarily be left in service until a comby spot 2½ in. long or over develops, or two such adjoining spots each 2 in. or over develop.

Your committee has suggested to the Arbitration Committee that the rule governing shelled out wheels be separated from that governing brake burns. The two defects are entirely distinct and a separation will be of help in clarifying billing. It was suggested that Rule 71 be changed to read as follows:

"Shelled out: All wheels with defective treads on account of shelled out spots 2½ in. in length or over, or so numerous as to endanger the serviceability of the wheel.

"Brake burns: All wheels having defective treads on account of transverse cracks or combines due to heating."

Passenger car Rule 7, Paragraph 3:

"Shelled out: All wheels with defective treads on account of pieces shelling out if the spots are over one inch in length or so numerous as to endanger the serviceability of the wheel.

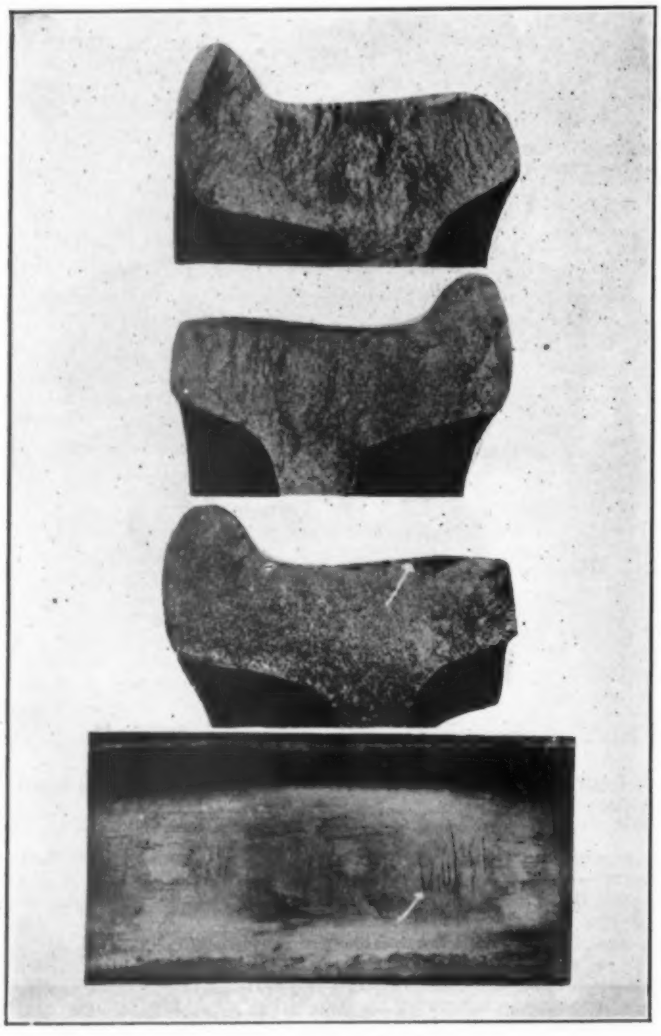


Fig. 8—Checks in Tread—Still Serviceable

Brake burns: All wheels having defective treads on account of transverse cracks or combines due to heating."

Wheel Mounting Pressure Tables

There has been considerable criticism of the wheel mounting pressure table shown in the Manual, page 55, section D. The committee has made a check of this in the railroad shops. It was found that when pressure recording gages are used it is practically impossible to stay within the limits set by the table even though micrometer gaging is used and the general practice is to run above the limits, as this is felt to be the safe side. Such tables should be practical and their effect is nullified if the shops are permitted to exceed them in either direction. Furthermore there is a general feeling that it is better to use a somewhat higher pressure in the mounting of steel wheels. In consequence of this investigation the committee recommends that the wheel pressure mounting tables be revised as follows:

Size of Journal	Old table A. R. A. Standard	New table A. R. A. Standard
	Steel Wheels	
3¾ in. by 7 in.	45—60 tons	50— 70 tons
4¼ in. by 8 in.	50—70 tons	55— 80 tons
5 in. by 9 in.	60—80 tons	70—100 tons
5½ in. by 10 in.	65—85 tons	75—110 tons
6 in. by 11 in.	70—95 tons	80—120 tons
6½ in. by 12 in.	....	85—130 tons
	Cast Iron Wheels	
3¾ in. by 7 in.	30—45 tons	30—55 tons
4¼ in. by 8 in.	35—50 tons	35—60 tons
5 in. by 9 in.	40—60 tons	40—65 tons
5½ in. by 10 in.	45—65 tons	45—70 tons
6 in. by 11 in.	50—70 tons	50—75 tons

Fig. 9—Two Wheels—Upper One Slightly Comby—Lower One Considerably Comby—Should Be Condemned

This change will permit establishment of absolute limits, a desirable improvement over present practice. The machining of the axle wheel seat and the wheel bore must be done in a workmanlike manner and a recording pressure gage should be used on all wheel presses. The pressure should increase uniformly as the wheel is pressed into place.

Length of Axle Wheel Seats

With the present standard design of wheel seat on axles it is practically impossible to check the size of the wheel bore on mounted wheels and difficulty in making this measurement correctly has resulted in controversy over billing for oversize bores. Your committee has recommended to the Car Construction Com-

mittee that the standard axle drawings be changed so as to increase the wheel seat lengths by ⅜ in. As a matter of fact this is frequently done in wheel shop practice but in order to standardize the practice your committee recommends that the standard drawings be changed.

Measurement of Lengths of Journals on Car Axles

There appears to be a lack of understanding of the proper method of measuring the length of journals on secondhand axles. It is usually found on secondhand axles that the junction of the fillet and the dust guard seat is somewhat rounded over and also the the junction of the inside face of the collar and the top of the collar. These rounded over portions should not be included in the measurement of journal length. However, it appears that many inspectors make the measurement in such a way as to include this rounded over portion and this results in scrapping serviceable axles. There is no standard gage for this measurement and a rule or scale is generally used. Inasmuch as the inside face of the collar is frequently not truly vertical it is possible to get different results when different men apply the rule for making the measurement. Fig. 10 shows in exaggerated form, the proper way to make this measurement if a rule is used. In this case the true measurement of the journal is 9$\frac{5}{16}$ in.

Fig. 11 shows a special sliding rule which has been used by one road for journal length measurement.

Wrought Steel Wheel Manufacturers' Technical Committee

The committee held a joint meeting with the technical committee of the Wrought Steel Wheel Manufacturers and has arranged for cooperation in the study of defective steel wheels.

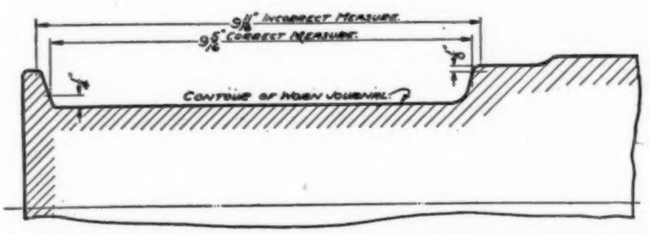


Fig. 10—Sketch Showing Correct and Incorrect Measurement of Journal Length

In this connection they hope to arrive at a standard nomenclature for these defects and a decision as to their cause. This joint investigation should result in a clarification of arguments between railroad companies and manufacturers.

Rolled Steel Wheels for Use on "F" Axles

It has been found that the design for rolled steel wheels for use on 6½-in. by 12-in. journal axles as shown on page 46, section D, of the Manual can not be made under the standard

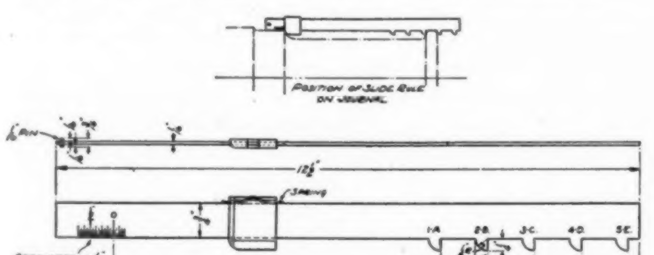


Fig. 11—Sliding Rule for Measuring Length of Journals

rolled steel wheel specifications because of the limits in these specifications providing for a minimum hub wall of 1½ in. The committee believes that the design should be left as it is and that the specification for the minimum hub wall should be changed to 1¼ in. instead of 1½ in. This will permit the interchangeability of wheels for use on 6-in. by 11-in. and 6½-in. by 12-in axles, whereas if the 1½-in. limit is required a special wheel will be necessary for use on 6½-in. by 12-in. axles.

Engine Truck Wrought Steel Wheels

At present there are no A. R. A. standard designs for wrought steel engine truck wheels. It appears desirable both from a manufacturer's and user's viewpoint to effect some standardization of wheels for this service. Tentative standards have been submitted by the wheel manufacturers as follows. It is understood that these recommendations may be altered after conference with the locomotive builders:

	Hub					Minimum thickness of plate, in.	
Diameter of wheel, in.	Front Projection, in.	Back Projection, in.	Front Diameter, in.	Back Diameter, in.	Length, in.	Above hub	Below rim
30	13/16	11/16	10	12½	7⅛	1	¾
33	13/16	11/16	10	12½	7⅛	1	¾
33	15/16	11/16	11	16	7⅛	1	¾
36	11/16	11/16	10	12½	7⅛	1	¾
36	11/16	11/16	11	16	7⅛	1	¾

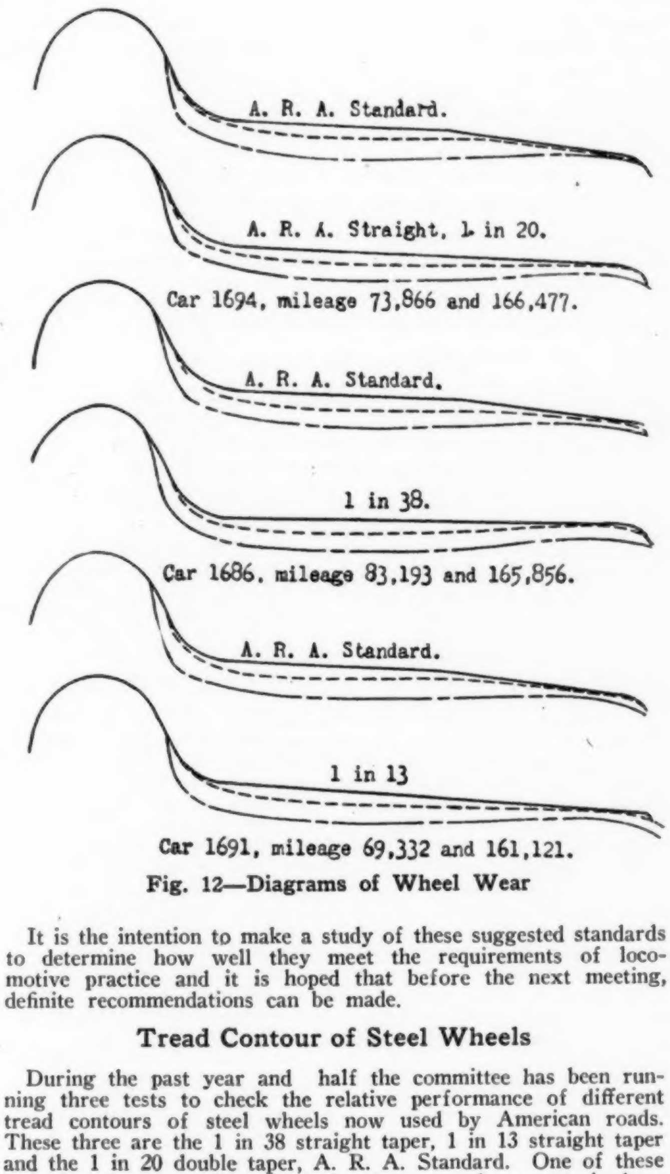


Fig. 12—Diagrams of Wheel Wear

It is the intention to make a study of these suggested standards to determine how well they meet the requirements of locomotive practice and it is hoped that before the next meeting, definite recommendations can be made.

Tread Contour of Steel Wheels

During the past year and half the committee has been running three tests to check the relative performance of different tread contours of steel wheels now used by American roads. These three are the 1 in 38 straight taper, 1 in 13 straight taper and the 1 in 20 double taper, A. R. A. Standard. One of these tests has been completed and the data may be summarized as follows:

The wheels were applied under baggage cars in overland service and a frequent record made of their contour by means of a contour machine. In each case wheels of one type were put in one truck of the car and wheels of another type in the other truck. One car truck was equipped with A. R. A. contour wheels but mismated by $\frac{1}{16}$ in. and ⅛ in. in diameter. This was done to show the effect of difference in diameter. One other experiment was also made with the A. R. A. 1 in 20 taper without the outside or drop-off taper.

Fig. 12 shows the average wear of the wheels of the different

contours. In each case these are averages of six wheels. The average contours at two different mileages, as well as the original contour, are shown. The following table shows the average cross-sectional area of metal removed from the wheels by wear, also the mileage per 1/64 in. of tread wear.

Car No.	Special straight tapers	mileage	Total wear, sq. in. A.R.A.	Total wear, sq. in. Special	Per 100,000 miles, sq. in., A.R.A.	Per 100,000 miles, sq. in., Special	Mileage per $\frac{1}{64}$ in. tread wear
1694	1–20	166,477	0.87	0.84	0.52	0.50	5,138
1686	1–38	165,856	0.91	0.95	0.55	0.57	5,072
1691	1–13	161,121	0.90	0.78	0.56	0.48	4,846

In a similar test on another road the test wheels have made a mileage of approximately 75,000 miles. The data have been worked up on the basis of flange wear instead of tread wear as in the previously quoted test. The results were as follows:

	Flange thickness, reduction per 100,000 miles
1 in 13 straight taper	0.079 in.
1 in 20 double taper	0.097 in.
1 in 20 straight taper	0.166 in.
1 in 38 straight taper	0.169 in.

There may be some difference of opinion as to the interpretation of these test results, but generally speaking it appears that the A. R. A. Standard double taper has somewhat the advantage from a wheel wear viewpoint. In the case of mismated wheels a very rapid flange wear developed. The small wheel wore a sharp flange in about one-half the mileage which was secured in the case of properly mated wheels. The mismating undoubtedly accounts largely for the wearing of sharp flange wheels. When data from the other road tests are available further report will be made.

There is some question as to the relative rail wear under wheels of these different tread contours. It is claimed that the 1 in 38 straight taper is desirable from a rail wear viewpoint due to its larger bearing area on the rail. It was of course impossible to get any rail wear data in these tests.

Wheel Manual

During the yast year your committee has give careful study to the tentative manual of wheel shop practice presented at the last convention. Criticism has been requested from various men engaged in shop work and the committee has been assisted by the comments secured. It was the intention to issue the final manual this year but conference with the technical committee of the Wrought Steel Wheel Manufacturers developed the fact that there was a serious different of opinion as to nomenclature and explanation of standard defects in steel wheels. The committee appreciates that there may be need for further study in this connection and a subcommittee is working with the manufacturers in a study of these defects. In view of this it was thought best to postpone the issuance of the manual for another year. This will also enable the committee to make a still further study of the various other parts of the manual.

In order to be of some assistance to those who are now using the manual we are listing the various changes on which agreement has been reached. As a matter of interest it may be noted that this manual is now being used on many roads and is proving of real service in that it enables the man on the job to have the best information available as to wheel shop practices. It is coming to be more and more realized that great savings can be secured through a more thorough knowledge of wheel shop practices and wheel defect gaging. The present plan is to separate the different sections of the manual when issued in loose leaf form so that portions of it can be assigned to different employes directly interested, although generally speaking all the employes should, if possible, use the entire book. This manual is also being used in some apprentice school rooms.

[The number of detail changes in the manual have been agreed and were presented by the committee.—Editor.]

Conclusions

The committee recommends that the following questions which have been discussed be submitted to letter ballot.

1—Change in hub requirements in wrought steel wheel specifications.

2—Establishment of the grinding of slid-flat cast iron, cast steel and one wear wrought steel wheels, as recommended practice.

3—Change in wheel mounting pressure tables.

The report is signed by C. T. Ripley (chairman), chief mechanical engineer, Atchison, T. & S. F.; O. C. Cromwell, assistant to chief of motive power & equipment, B. & O.; H. E. Brownell, general foreman foundry, C., M. & St. P.; G. B. Koch, general foreman foundry, Penn.; H. W. Coddington, engineer tests, N. & W.; A. Knapp, inspection engineer, N. Y. C.; and John Matthes, chief car inspector, Wab.

Discussion

(The following introductory comment was made by Committee Chairman Ripley before reading the report—Editor.)

C. T. Ripley (A. T. & S. F.): The reason we have attempted to reach out beyond what is generally considered the scope of a committee's work is that we felt we could, in that way, be of maximum service to you.

We have three major aims in our committee work. The first is, we are trying to help the manufacturers and thence the railroads in the development of improvements in their product. Now, in doing this we do not mean to condemn any one of these products. They are like all other railroad products, or rather materials used in railway equipment; they are subject to continual improvement, and I want to pay tribute to what the manufacturers are doing, and by "manufacturers" I mean the makers of wrought steel wheels, the makers of cast steel wheels, and the makers of chilled iron wheels. They are all advancing, and are by no means at the end of the road. They are going to make and are making better and better wheels, and all of us gain thereby.

The first object of your committee is to work with these gentlemen, assisting them in coöperative tests to try to help along this work.

The second object of your committee is to try to be of assistance to the Arbitration Committee in connection with the rules for the gaging and condemnation of wheels of all types. We have felt there are too many judgment defects in the rules and we have gradually been working towards the elimination of judgment defects, and turning them into measurable defects. It is not easy in many cases as the defects are rather hard to establish under a measurable rule, but we are making progress.

The third main object of your committee is to try to assemble all the information we can about the best ways of handling wheel work. It is for this purpose that we worked up the Manual, which will be referred to later in the report.

A. Knapp (N. Y. C.): The Committee included a drawing in last year's report of a suggested gage for use in mounting wrought steel wheels. Further study of the use of this gage has indicated that the inside gage of flanges should be adjusted to 4 ft. 5¼ in. instead of 4 ft. 5$\frac{3}{32}$ in. as shown in last year's report. The Committee has, therefore, prepared another sketch which is shown to illustrate a mounting gage for wrought steel wheels. The gage differs somewhat from the standard wheel mounting and check gage for chilled iron wheels in that the contact points apply to the back face of the wheel rim rather than the back of the flange. The check gage distance and the spacing of the gage between the inside gaging points has been adjusted so as to conform with the flange thickness of wrought steel wheels, which varies from the flange thickness of chilled iron wheels. The method of application is the same for both gages with the exception that when wrought steel wheels with worn flanges are mounted the wheels should be mounted to inside gage limits as explained in the note included in the sketch.

The standard A. R. A. gage for mounting cast iron wheels has been criticised because of difficulty experienced in mounting two wheels with maximum flange thickness. Difficulty is also reported in connection with the mounting of wheels with reinforced flanges such as are used on a number of roads. The suggestion has been made that the standard gage for mounting chilled iron wheels be changed by cutting the flange face contact point back $\frac{1}{32}$ in. at each end of the gage in order to make this gage serviceable for mounting wheels with reinforced flanges. From a track viewpoint this seems desirable as a mounting

of the wheels closer to the rails should result in less rail wear and may also be desirable from the flange wear viewpoint.

The committee feels that this is a subject of such importance that a careful study of all the features involved is necessary. The committee would prefer, therefore, to study the matter further during the coming year and make definite recommendations at the next convention.

At the 1925 convention, the Committee reported a conference held with the representatives of the various wrought steel wheel manufacturers and the organization of a technical committee representing all of the wrought steel wheel manufacturers in accordance with our request for study and development of wrought steel wheels to meet the requirements of present service. Several important questions have been discussed with the representatives of the Wrought Steel Wheel Manufacturers Technical Committee during the past year and we should like to report progress in connection with the study of wheel defects and means for their reduction. One important feature of this study is the development of a standard nomenclature for wrought steel wheel defects, including such investigation as may be required to develop the actual cause for failures. A subcommittee of the Wrought Steel Wheel Manufacturers' Technical Committee has been appointed to coöperate with a subcommittee of your Wheel Committee and arrangements have been made for accumulation of defective wrought steel wheels representing various types of defects in the shops of member roads, there to be inspected, photographed and when necessary for satisfactory classification of defects chemical, physical and other laboratory tests.

The committee has received a request from the Wrought Steel Wheel Manufacturers' Technical Committee for coöperation in the matter of reports of results obtained through service tests of what might be termed experimental wheels placed in service on various railroads. We urge your coöperation with the manufacturers in this matter. Wheels have been manufactured from steel varying in composition from the material ordinarily used, also wheels when completely fabricated have been subjected to special heat treatment and other experiments have been made all at considerable expense to the manufacturers for the benefit of the railroads as a whole. Many wheels have been shipped to various roads for trial in service and the manufacturers report considerable difficulty in securing reports on the results of tests under actual service conditions. The committee has addressed a letter to several of the member railroad companies explaining this situation and we would like to urge upon all the necessity for as complete reports as possible in connection with all experimental material to the end that the service of the wrought steel wheel may be improved in every possible manner to meet the exacting requirements of heavy tender service.

It has been found that the design for rolled steel wheels for use on 6½-in. by 12-in. journal axles as shown in Section D of the manual, can not be made under the standard rolled steel wheel specifications because of the limits in these specifications providing for a minimum hub wall of 1½ in. The committee, after checking this matter over, believes that the design should be left as it is and that the specification for the minimum hub wall on these wheels should be changed to 1¼ in. instead of 1½ in. This will permit of the interchangeability of wheels for use on 6 in. by 11 in. and 6½ in. by 12 in. axles, whereas if the 1½ in. limit is required a special wheel will be necessary for use on the 6½ in. by 12 in. axles.

O. C. Cromwell (B. & O.): Referring to the recent design of single plate chilled cast iron wheel mentioned in the report, we wish to direct your attention to a few of the important points in the design as well as some of their performance.

The superimposed views of the double and single plate wheel do not show fully the improvement in the better distribution of metal in the plain single plate design over the more complex design of the double plate wheel, in which the irregular section of metal near the juncture of the single and double plate is accentuated by the overlapping of the brackets on the inner plate, is not so apparent as when observed in the wheel itself, showing up strikingly as a contributing factor in heat concentration by brake shoe action at this point, increasing the tensile stresses there above that in the other parts of the wheels. While examination of the single plate wheels shows practically uniform section of metal throughout, due to omission of brackets and elimination of sand core, and while there is a heavier section of metal at the hub to care for mounting pressures, there is a gradual tapering from the heavier to the lighter, avoiding abrupt change in section. An analysis of the distribution of metal in the single plate wheel brings out its ability to absorb and dissipate the heat into the wheel and prevent overstressing of any point. This analysis is confirmed in the performance of wheels in road service as no plate failures have occurred as far as has come to the attention of the committee and the thermal test at the foundries has developed their ability to resist the heat stresses greatly beyond that of the double plate wheel even when tested with heavier thermal rings.

Test of Single Plate Wheels

Drop Test—Standard. Standard test, double plate 750-lb. wheel, 12 blows, 12-ft. drop, 250-lb. weight

Test of New Design Single Plate:

1—750-lb. wheel, single plate, drop test stood 83 blows, 12-ft. drop, 300-lb. weight.

1—750-lb. wheel, single plate, drop test stood 78 blows, 12-ft. drop 300-lb. weight.

Thermal Test—Standard. Standard 700-lb. wheel 1¾-in. band, 2 min. without breaking or cracking

Standard 750-lb. wheel 2-in. band, 2 min. without breaking or cracking.

Test of New Design Single Plate:

700-lb. wheel tested with 3-in. band, 7 min. before cracking.

750-lb. wheel tested with 3-in. band, 10 min. before cracking.

xx750-lb. wheel tested with 3-in. band, 5 min. before cracking.

Note: The wheel marked xx was tested and stood 15 min. the day before the above test, was taken out and the hub rebored and tested again on the above date. It is of interest to note that the hub did not show anything when examined after re-boring.

Chemical Analysis of Iron used:

Silicon	0.62
Sulphur	0.134
Phosphorous	0.303
Manganese	0.66
Combined Carbon	0.72
Graphitic Carbon	2.56

A. R. A. Manual Wheel & Axle Practice. 1-8-26.

15. Steel Wheels. Wheel Mounting Pressures.

Axle Sizes	3-¾x7	4-¼x8	5x9	5½x10	6x11	6½x12
Present N. Y. C. Standard A. R. A.	45-60	50-70	60-80	65-85	70-95	
N. Y. C. Standard From 5-1-15 to 12-26-23	54-72	66-88	72-96	78-104	84-112	90-120 (16 tons per in.)
N. Y. C. Standard From 8-31-04 to 5-1-15	36-47	41-52	49-61	52-65	57-70	60-74 (9 tons per in.)
Calkins and N. Y. C. Wheel Committee recommend	50-70	55-80	70-100	75-110	80-120	85-130
Downing, Mullen & Downs all recommend increase and wider range						
Chidley recommends	60-80	65-80	75-100	85-100	90-115	
Senger recommends	50-75	55-80	75-100	85-100	90-115	
Pullman Co. recommends			75-100			
Jennings recommends increasing maximum 15 tons over A. R. A. Standard						

Cast Iron Wheels

Present N. Y. C. (Standard A. R. A.)	30-45	35-50	40-60	45-65	50-70	
N. Y. C. Standard From 8-31-04 To 5-1-15	31-42	35-46	42-54	45-58	49-62	52-66
Calkins and N. Y. C. Wheel Committee recommend	30-55	35-60	40-65	45-70	50-75	
Downs recommends—No Trouble with C. I. Pressures and only allows 5 tons excess.?						
Downing & Mullen recommend limits should be increased to avoid loose wheels.						
Chidley recommends	30-55	35-55	40-60	45-65	50-70	
Senger recommends	30-50	35-55	40-60	45-65	50-70	

Mr. Cromwell: The general result of observation and the tests has brought to the attention of the committee that in the drop tests your single-plate cast iron wheel, when it breaks, punches the hub through the plate and rarely extends through the rim, and when that does happen it only breaks through the rim at one point and therefore the wheel will not cause any trouble on the line. But in the case of your double-plate wheel, when you have the crack extending into the rim, it goes through in a "V" form and causes a certain section of the wheel to drop out.

As regards to mounting pressures, a careful checking of the practice developed that the shops were working above the higher limits. This is brougth about by difficulties in stopping the wheel press between the limits heretofore published on the heavier wheels. The new limits shown in the table presented have been found to be safe and will promote respect for these pressures and encourage more universal use of recording pressure gages, a desirable and economical measure.

If we can get the shop people to pay a wholesome regard to mounting pressures we can, by applying pressure recording gages, afford a great deal of protection to transportation, and for that reason we looked into the tests of the wheels on this mounting pressure in a number of shops. For eight years and more some of the prominent roads have been increasing the pressures on 3¾-in. by 7-in. axles. Where we had a limit of 45 to 60 tons before, they run up from 54 to 72 tons so the recommendation is within those limits. In case of 4½ in. by 8 in. axles, we had 50 to 70 tons andthe practice that we found existent was 66 to 88 tons which is higher than our recommendation. In 5-in. by 9-in. axles and our steel wheels we had 60 to 80 tons and found existent 72 to 96 tons; 5½-in. by 10-in., 65 to 85 tons, we found 78 to 104 tons and 6-in. by 11-in., 70 to 95 tons, we found 84 to 112 tons. These pressures are based on 16 tons per in. of diam.

In the case of cast iron wheels we found the following:

Size Journal	Recommended Pressure Tons	Actual Pressure Tons
3¾ in. by 7 in.	30 to 45	31 to 52
4¼ in. by 8 in.	35 to 50	40 to 60
5½ in. by 10 in.	45 to 65	50 to 70

On the whole, the question of loose wheels, and the indication of looseness as shown by a thin mounting compound encouraged the committee to give this data consideration and we feel sure that it is going to add to the service of wheels.

J. J. Tatum (B. & O.): The first thing I want to speak on in the report is the grinding of slid spots out of the wheels. Just how much that will mean when we use a machine to grind the wheel all around none of us can say other than that it is the proper way of doing it. That we must concede, but the fact remains, if that is proper and necessary for the same reason that we grind that slid flat spot out by grinding the wheel all around in order to get it perfectly round, shouldn't we start with the new wheels and get them perfectly round?

They spoke of making the mounting pressure higher. We have very few loose wheels and when we do the cause is usually a poor wheel fit, either on account of the wheel being poorly poured or the axle being poorly turned.

What will be the effect of increasing the pressure to mount these wheels? Will it aggravate the conditions now existing to whatever extent they exist—that are helping to make loose wheels for us or will it improve them?

I am taking the position that it is not going to help at all. The thing to do is to get the fit proper, at the existing pressure, and we will have all we will need.

F. H. Becherer: (C. N. J.) I believe that the Manual of Wheel Practice and the report of this committee in its entirety should be given not only to the wheel mounting points, but to every point where wheels are removed.

In regard to the grinding of wheels, I believe that every one of us are agreed that a better condition can be obtained by the grinding of every new cast iron wheel and I certainly cannot consistently agree that a 2½-in. flat spot can be taken out by only grinding that spot, because a careful test was made of wheels which had the flat spot ground out, not in its entirety, and trouble was experienced, particularly in arch bar trucks, with journal boxes and box bolts. It is almost impossible to keep them on.

The importance of loose wheels and the connection with the mounting pressures causes me to say we have paid considerable attention to the pouring of wheels and the turning of axles and, although done by competent workmen, we find it almost an impossibility to meet the requirements of the pressure as stated in the present A. R. A. rules, I hope that these pressures will be increased in accordance with the recommendations as laid down by the Wheel Committee.

Mr. Tatum: Will you permit me to say a word about grinding flat spots. I did not say to grind only the spot. I do not want anybody to get the impression that I would go along with anything of the kind. I did not say how far you should grind such a spot, but there is a possibility of getting rid of a slid flat spot without grinding the wheel all around, and not making it any more out of round than a number of new cast iron wheels are today.

About the pressure, I still contend for my position on the pressure of pressing the wheel on the axle. If your press is equipped with a gage and the key is taken from the wheel press man and a record is made of the pressure to which each wheel is mounted on the axle, you should know whether your wheels are mounted correctly or not, or mounted in accordance with the pressure as set up for the wheel man to use when mounting the wheel.

Mr. Ripley: May I say something in regard to pressure? I think perhaps the wording of our report on that the change in mounting pressures is not as clear as it might be. The increase in the mounting pressures on steel wheels is largely to get better fits. You are doing it in locomotive practice. This practically follows the same rule that you follow in steel wheels on locomotives. Our pressures were too low, and has been causing trouble by loose wheels on Pullman cars.

However, I agree with Mr. Tatum that the majority of the trouble is due to improper workmanship, but after careful consideration by the committee, we feel we are going to get better fits on the average with a higher pressure. In the case of cast iron wheels it is not simply to protect poor workmanship, but to make a real rule to work by.

As to the grinding of wheels, we do not wish to be dogmatic and to condemn absolutely this practice with these portable machines which merely grind the spot in the vicinity of the slid flat. However, remember that grinding the full circumference has been followed for 15 years and has proved itself. At least, let us allow this other proposition to go through its probationary period before we make it recommended practice.

O. D. Buzzel (A. T. & S. F.)

Wheels, Cast Iron: I feel that the lip chiller is a great improvement over the old sand rim, and I have yet to find a wheel made with the lip chiller that we have had to remove on account of chip or broken rim, while with the old sand rims we are continually removing them for this defect.

Reinforcing ring plate: After watching this matter closely for a considerable time, I am convinced that the making of wheels with reinforced rims is giving good results, and that it will materially reduce the necessity for changing wheels on account of cracked plates. These

rings have a tendency to catch the slag in the metal in the rim of the wheels, thereby keeping it out of the outside plate of the wheel.

Wheel grinding: I feel that a ground wheel is far superior to any second-hand wheel and when these wheels can be reclaimed at a rate of two or three pair per hour with one man handling the machine, it is certainly a paying proposition, and the grinding of newly mounted wheels, I believe, is worthy of consideration. Any cast wheel is liable to be a trifle out of round and by putting them through the machine, which can ordinarily be done in 15 minutes, makes an absolutely round wheel and true with the journal.

The use of this machine is also advantageous in grinding steel wheels, and oftentimes saves a large amount of metal by the grinding of flattened steel wheels in place of turning them in the ordinary lathe, as these wheels can be ground with less than one-half the loss of metal that there would be if you were to turn them in the lathe.

Personally I feel that the committee was entirely too modest in what they claim for the advantages of the grinding of wheels, and I am sure that any one who installs a modern grinder at a point where a large amount of wheels are exchanged will get excellent returns on their money. Trainmen in our territory all insist on having ground wheels in their cabooses as they claim they ride much better than cast unground wheels, and if the riding qualities of ground wheels will save a man from jarring and jolting, it will certainly have claims when applied to box and refrigerator cars where fragile and perishable freight is handled.

Brake burned wheels: What I have to say will deal principally with the prevention of brake burned wheels. We have been able to reduce brake burned wheels approximately 20 per cent in my territory, principally due to the application of a heavier retarded release spring in the triple valve for the prevention of undesired emergency, especially in certain seasons of the year. The enginemen on three transcontinental southwestern roads were so afraid of this undesired emergency that they would allow their trains to gain too great a speed before applying the brakes so that if they did go into emergency it would not break them in two, or otherwise damage the equipment. Consequently heavy braking at the high speed heated up the circumference of the wheel quickly, which resulted in brake burned wheels. After the application of this spring it was found that undesired emergency ceased and then by education of the enginemen by road foremen and air brake instructors, they were able to do the braking in a manner that would put the heat gradually into the wheel and give the wheel a chance to heat through and radiate with much less damage to the circumference of the wheel. When I tell you that approximately 70 per cent of the wheel changes in this territory were due to brake burned wheels and in a little over a year's time we have made a reduction of 20 per cent and expect to go further, it will emphasize what I want to bring out—the adoption of this spring by the American Railway Association Committee on train brakes.

While it may be said by a number of roads that they are not interested in the changing of the standard retarted release spring for the reason that they have no mountain grades or have any territories where undesired emergency is prevalent, I feel that they should be interested as their equipment passes over roads continuously that are so affected and they naturally pay for the wheels and oftentimes the damage to their equipment due to this undesired emergency.

A motion was made and carried that the report be referred to letter ballot.

The fourth session of the convention adjourned.

Registration, American Railway Association

(*Continued from Page* 1817)

Lyons, Harry, Insp., Penna.
Lynch, G. G., Asst. Mech. Eng., A. C. L., Haddon Hall
McAlpine, J. H., S. M. P. & Car Dept., Can. Natl., Shelburne
McDonald, A., Supt. Shops, Can. Natl., Haddon Hall
McGary, A., Ch. Elect., N. Y. C., Haddon Hall
McKinney, C. F., Supv. Erie, Dennis
McLone, J. E., Shop Supt., Wab., Traymore
Martin, A W., Supt. of Shops, C. C. C. of St. L., Ritz
Martin, F. O., Shop Supt., N. Y. C., Haddon Hall
Mechling, J. E., Spl. Insp., Penna., Craig Hall
Merrick, George A., Asst. to Mech. Engr., N. Y. N. H. & H., Stevenson
Michael, L. R., Mech. Eng., C. & N. W., New Iroquois
Minick, Asst. Engr., Penna.
Moll, Geo., R. F. E., P. & R.
Moore, Wm., M. M., Erie, Pennhurst
Moores, Geo. O., Asst. Eng., B. & O., Princess
Moseley, W. S., Mech. Eng., Clinchfield, Shelburne
Moss, F. K., M. M., B. & O. Traymore
Muelheim, L. C., Ch. Headlight Supvr., B. & O., Crain Hall
Mullen, D. J. S. M. P., C. C. C. & St. L., Ritz
Murphy, Fred K , Asst. S. M. P., C. C. C. & St. L., Ritz
Murphy, J. Wm., Gen. For., B. & A., Breakers
O'Meara, J. W., Supt. Shops, N. Y. N. H. & H., Monticello
Paris, Louis O., Mot. Pow. Insp., Penna., Traymore
Parsons, C. F., Gen. M. M., N. Y. C., Chalfonte
Peterson, W. A., Shop Eng., C. P. R., Haddon Hall
Phillips, Robert J., Supt. Car. Ser., Penna.
Pickerell, W. J., Dist. M. M., Can. Pac., Strand
Porter, S. E., M. M., A. C. L., Haddon Hall
Powell, N. M. Supt. Equip. & Shops, Phila. R. T., Traymore
Price, C. W., Asst. Elec. Car Ltg. Supvr., B. & O., Marlborough
Prindall, W. H., M. M., B. & M., Shelburne
Quinn, M. A., M. M., D. L. & W., Haddon Hall
Ramage, J. C., Eng. of Tests So., Chalfonte
Rauch, H. S., Div. S. M. P., N. Y. C., Chalfonte
Raynor, Chas. B., Welding Supvr., B. & O., Princess
Redinnick, Stanley W., Boiler For., D. L. & W., Haddon Hall
Reese, O. P., S M. P., Penna., Ritz
Riddell, Frank, Ch Insp., Penna.
Riegel, S. S., Mech. Eng., D. L. & W., Runnymede
Riggs, J. R. M. M., Penna., Traymore
Ritter, Otto H., M. M., N. Y., H. & H., Traymore
Robertson, G. W., M. M., C. & O., Breakers
Roderick M. B., Supvr. of T. & M., Erie, Princess
Ronaldson, F., M. M., C. P. R., Ritz
Roquemore, J. P., Mech. Asst, Mo Pac., Chalfonte
Rusling, W. J., Insp., Penna.
Russell, Walter L., Gen. For., P. & R., Stevenson
Ruttger, Fred V. Asst. Gen. For., L. S.
Sanderson Harry M., Sec. to Pres., C. R. R. of N. J.
Schmidt, V P., M. P., Insp., Penna.
Schneider, G. A., M. M., Penna., Iroquois
Sederquest, W. R., M. M., N. Y. N. H. & H., Chatham
Shults, L. C., M. M., So., Traymore
Simpson, F. C., M. M., So., Rittenhouse
Sinclair, Earl, V. P., Sinclair Tank Line, Dennis
Singer, A. J., V. P., St. Cloud, Dennis
Singer, Jas., M. M., N. Y. C., Chalfonte
Sloan, J. R., Ch. Elect., Penna., Dennis
Stewart, M. D., M. M., So., Rittenhouse
Strain, Chas. E., Gen. For., H. V., Ritz
Strauss, M. H., M. M., N. Y. C., Dennis
Sugg C. R., E. E., A. C., Haddon Hall
Sutherby, A., M. M. Erie, Ritz
Sweeley, E. H., Cen. For. Loco. Rep., L. I., Chalfonte
Swope, B. M., M. M., Penna., Ambassador
Tait, Edwin E., Pres., P. & S., Ritz
Tait, R. H., M. M., Mo. Pac., New Iroquois
Thibaut, Geo., M. M., Erie, Princess
Todd, John, Shop Supt., Erie, Princess
Topping, F. J., Gen. For . C. & O., Breakers
Tuma, F. M. M., Erie, Princess
Turner, J. S., Life Mem., Pressed Steel Car, Marlborough
Wardwell, Fred N., Asst. Eng. Elec. Dept., N. Y. C., Strand
Watson, R. B., Eng. of Test, Erie, Haddon Hall
West, G. S., Asst. M. M., Penna., Chalfonte
White, B. B., Sec. V. P., C. R. R. of N. J., Dennis
White, C. M., Gen. Supt., Monongahela, Haddon Hall
White, S. Lowell, Supt. Trans. A. C. L.
Wilbur, Rollin H., V. P. & G. M., L. & N E.
Wilking, J. A., M. M., So., Traymore
Willey, D. F., Asst. Supt. of Shops, N Y. N. H. & H.
Wilson C. A., M. M., Penna.
Wilson, D. H., Shop Supt., F. E. C., Sterling
Winship, L. C., Elec. Supt., B. & M., Haddon Hall
Womble, J. W., Mech. Supt., M. V., Breakers
Wood, H. T., Asst. Eng. Mot. Bow., N. Y. C., Pennhurst
Van Gundy, C. P., Eng. Tests, B. & O., Haddon Hall
Zimkowski, Frank, Supvr. of Equip., N. Y. N. H. & H., Colonial

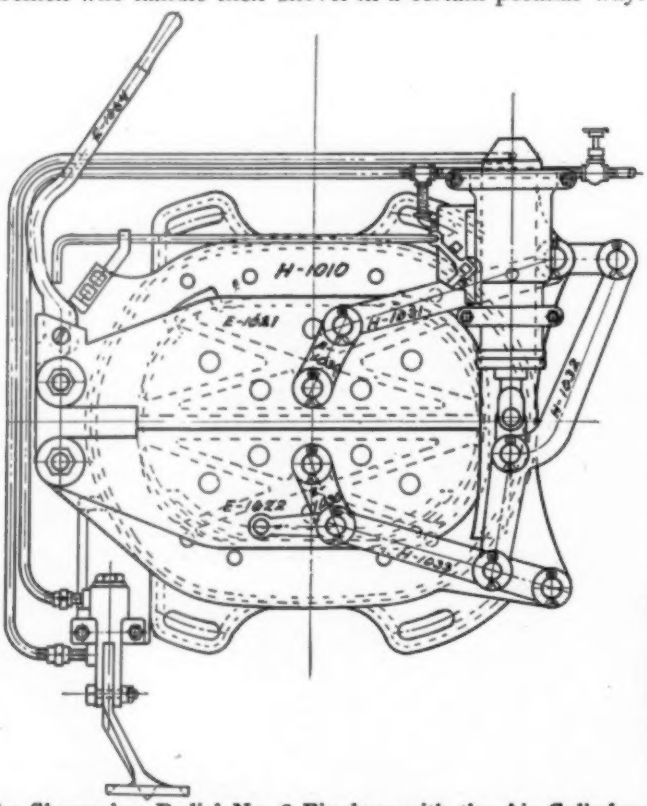
Division VI—Purchases and Stores

Brown, A. A., Asst. S. K., C. of N. J.
Brown, W. G., Supvr. Materials, B. & O., Louvan
Butterworth, J. A., P. A., So., Princess
Dyson, C. H., Asst. Fuel Agt., B. & O., Ritz
Haller, N. M., S. K., B. & L. E., Haddon Hall
Hauck, H. B., Ch. Clk. Gen. P. A., Penna.
Hubbell, C. C., P. A., D. L. & W., Ritz
McNichol, Bernard I., S. K., P. & R., Osborne
McQuade, H. J., P. A., L. V., Galen Hall
Rhoads, C. W., S. K., C. of N. J.
Scatchard, H., Ret., N. & W., Ritz
Schaefer, C. L., Insp., Penna.

New Devices

Change in Shoemaker Radial Fire Door

IN THE original design of the Shoemaker radial fire door, the air cylinder was located on the left side of the fire door. Experience has proved that to some firemen who handle their shovel in a certain peculiar way.



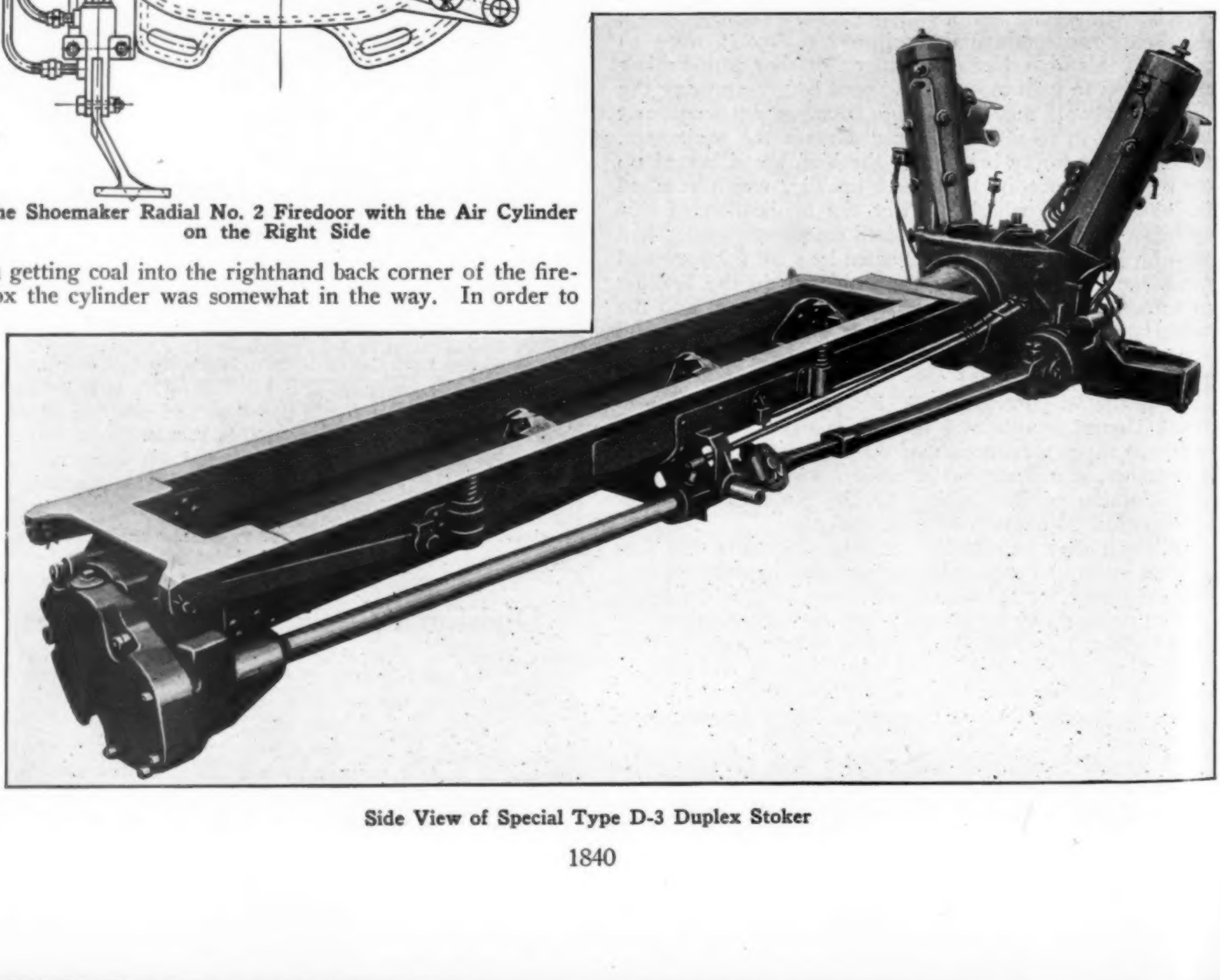
The Shoemaker Radial No. 2 Firedoor with the Air Cylinder on the Right Side

In getting coal into the righthand back corner of the fire-box the cylinder was somewhat in the way. In order to overcome this difficulty, the fire door has been redesigned only to the extent of locating the cylinder on the right side of the fire opening, leaving the left side of the fire opening free. In all other respects the fire door is identical in design with the radial doors now in service. The Shoemaker radial fire door is being exhibited by the National Railway Devices Company, Desplaines and Fulton streets, Chicago.

Type D-3 Duplex Locomotive Stoker

THE Locomotive Stoker Company, Pittsburgh, Pa., is exhibiting a new form of the Duplex stoker, known as the D-3 which is a modified form of the types D-1 and D-2, made to meet certain special conditions. The operating principles are identical with the D-1 and D-2, and it is not intended to supersede the previous models. It is, however, considerably lighter and smaller.

The principal difference between the type D-3 and the former types is in the driving engine. The D-3 is driven by an eight-inch diameter reciprocating engine operating on the same principle as the D-1 and D-2 engines. All the valves, however, in the D-3 engine are piston valves instead of slide valves as used in the previous stokers.



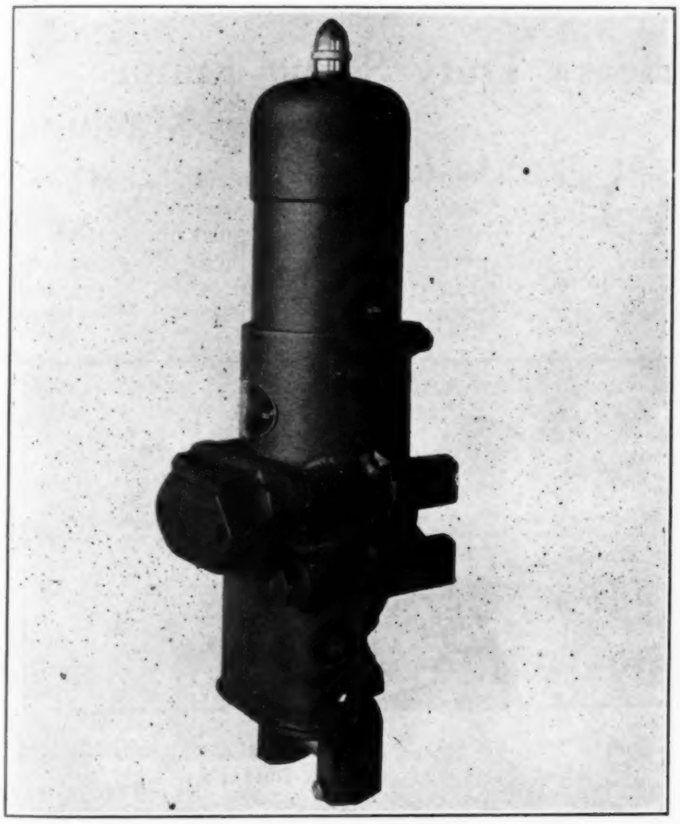
Side View of Special Type D-3 Duplex Stoker

This allows a much smaller and lighter head construction without restriction of steam passages. This smaller diameter piston, however, does not reduce the power of the engine, as a higher steam pressure can be used and still not increase the steam consumption of the engine. The same conveyor reverse system is used in this stoker except that it was made somewhat smaller and the centers are lowered and moved in toward the hopper center to accommodate a smaller main drive pinion.

The tender unit of the D-3 is identical with the latest developments of the D-2 trough and is entirely interchangeable with it, with the exception of the conveyor drive gears, which are of a different ratio than used on the D-1 and D-2 troughs. The lubricating features of the D-3 are similar to the D-1 and D-2 stokers.

Westinghouse Air Shock Absorbers

THE Westinghouse Air Spring Company is exhibiting for the first time its new, large size transit model, air operated shock absorbers for large buses and trucks. This development follows substantially the



The Transit Model Air Operated Shock Absorber for Large Buses and Trucks

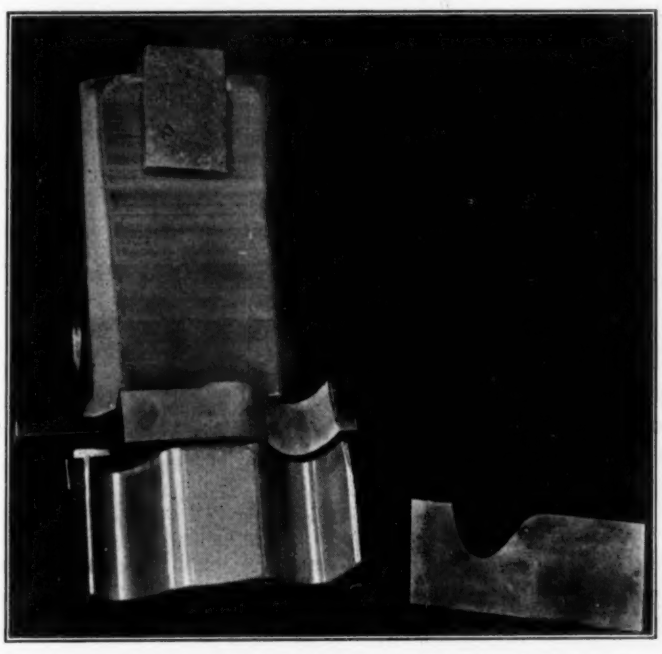
same design as used on the smaller model, the stage, working both ways on air, to take the compression shock of obstacles in the road and to function in the opposite direction to equalize the negative bumps or depressions in the road. This large model, although 4½ in. in diameter at the cylinder and having a supporting area of 15.9 sq. in., weighs only 65 pounds.

The saving effected in maintenance and upkeep on buses and trucks, due to the reduction of destructive vibration, alone will compensate for its initial cost. The additional comfort afforded the driver and passengers is also a large factor that has led to the use of this device on a great number of steam railway motor fleets. The first installations were made on buses operated by the Northland Transportation Company of Duluth, Minn., and the Twin Cities.

Tire Reconditioning Device

THE Universal Packing Corporation, 342 Second ave., Pittsburgh, Pa., is exhibiting a tire reconditioning device designed to reduce high, thick and vertical flanges, to remove rolled out metal from the tread of blind tires and to reduce metal on the tread of flanged tires, without removing the driving wheels.

The device consists of a tool holder designed to be substituted for the driver brake head and a standard contour cutting tool. The power for holding the cutting tool



Cutting Tool for Reducing Flanges or Treads of Locomotive Driving Wheels on the Locomotive

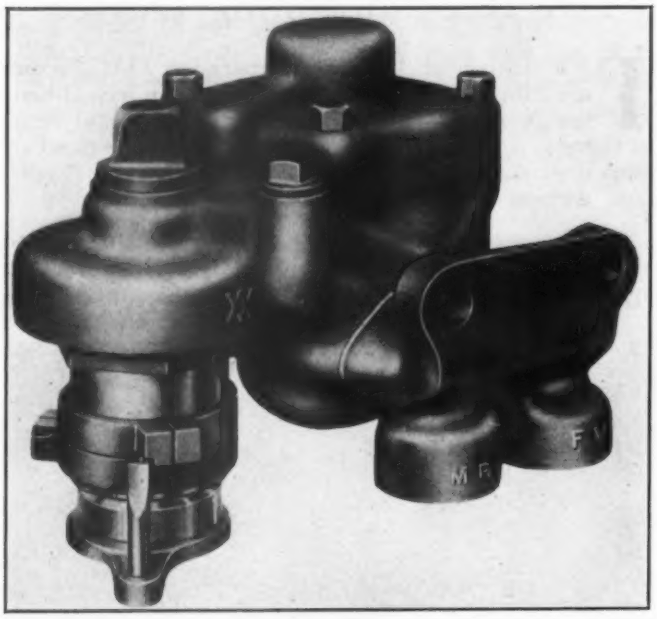
against the tire is obtained by the application of the driver brake, about a 15 or 20 lb. brake cylinder pressure being required. With the reconditioning device held against the tire the turning operation is effected by moving the locomotive at a slow speed. One shape of cutting tool is for reducing high, thick or vertical flanges and another for removing metal from the tread.

If the brake head is hung ahead of the driving wheel the locomotive is moved forward. On the other hand, if the brake head is hung behind the driving wheel the engine should be moved backwards either under its own steam or by towing. The depth of the cut with this device can be regulated by the amount of brake cylinder pressure applied.

It is said that the device may be applied by an unskilled mechanic in a few moments and that the reconditioning of driver tire flanges can be accomplished in from 20 to 30 minutes.

New Westinghouse Type M Feed Valves

TO MEET the demand for a high capacity feed valve the Westinghouse Air Brake Company, Wilmerding, Pa., has developed and is exhibiting the Type M, which is here illustrated. Like the well-known Type B feed valve the Type M valve is available in two classes —the M-3 for single pressure, and the M-3-A for double



The Type M Feed Valve is Designed For Easy Renewal of Parts

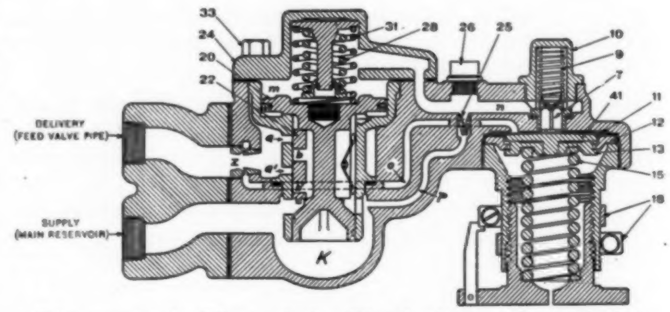
pressure control. While its function as a feed valve is the same as that of feed valves now in general use the construction and operation of the Type M valve are somewhat different.

A by-pass choke provides a fixed relationship between pressures on the two faces of the ring-fitted supply piston. This piston tends to keep the bushing free from dirt and gumming, qualities which are further enhanced by a double piston spring of sufficient power to overcome reasonable resistance to piston movement by dirt accumulation.

Type M feed valves are said to have a low maintenance expense because of easy bushing renewal. All parts, including the supply valve and regulating valve bushings, can be easily replaced without the use of special tools. Wabco gaskets are used.

By virtue of a venturi tube control, the Type M feed valve sustains air delivery flow up to the point of closure. Referring to the diagrammatic view, main reservoir air, in flowing through the restricted opening of the venturi tube *z* to the lower pressure in the feed valve pipe, develops an increased velocity and a corresponding pressure decrease at this point. The diaphragm chamber is in communication with the venturi tube through the passage *C* so that the pressure in the diaphragm chamber is reduced below the feed valve pipe pressure, thereby permitting the regulating spring *15* to fully open the regulating valve *7*, thus allowing a greater air flow with a consequent greater reduction of pressure on the face of the supply piston *20*, which therefore holds the supply valve in full delivery position.

As the feed valve pipe pressure approaches the pressure for which the feed valve is adjusted, the velocity of flow through the venturi tube diminishes. Therefore, its effect of reducing the pressure in the diaphragm chamber becomes proportionately less, thus permitting an accumulation of pressure in the diaphragm chamber, which tends to close the regulating valve at its true setting.

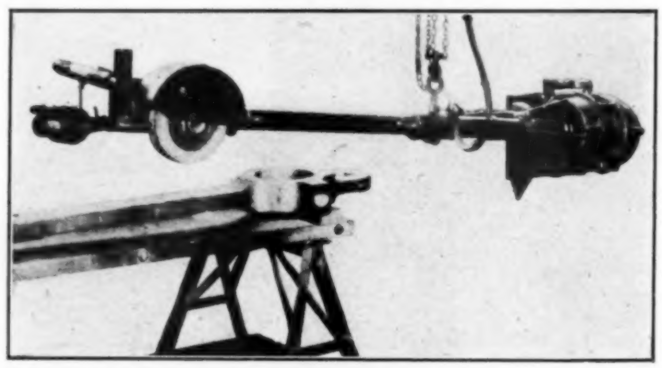


Diagrammatic View of the Westinghouse Type M-3-A Feed Valve

The ease and thoroughness with which this valve may be cleaned will appeal to those concerned with its maintenance. Inasmuch as the bushings are of the slip type, a wrench and screw driver are the only tools necessary for the complete removal of parts.

Heavy Duty Swing Frame Grinding Machine

ONE of the exhibits of the Diamond Machine Company, Providence, R. I., is a heavy duty swing frame grinding machine designed for service in railroad shops where there are many pieces to be ground, such as heavy pieces from which fins, gates, risers and sprues are to be removed, which can not be brought to



Grinding Machine Swung from a Chain Hoist and Balanced to Insure Ease of Operation

the floor grinder. The illustration shows the machine with the grinding head and motor rigidly fastened to either end of a tubular arm through which runs the driving shaft. The wheel head is equipped with nickel steel spiral bevel gears, fully enclosed and running in grease. An 8-in. chain fall is furnished with each machine. The wheel is easily accessible and may be removed without disturbing the spindle or any adjustments, as it is only necessary to take off the front cover of the guard, four nuts and the loose flange. Straight side grinding wheels are furnished unless otherwise specified. Safety flanges having a taper of ¾ in. to the foot on each side of the wheel can also be furnished if desired. The guard is made in accordance

with the specifications of the American Engineering Standards Committee.

The grinder, hung from a chain hoist, can be moved over a considerable area, and when hung from a traveling crane its field of operation may be considerably increased. As the motor is direct-connected, there are no belts to hamper its movement. The chain hoist for raising and lowering, is secured to the tubular arm of the machine at its center of gravity. The arm with the grinding head can be turned 360 deg. on the chain fall. By twisting the wheel the operator can grind the top and both sides of his work. The ball bearings of the grinding wheel are enclosed in a dust proof chamber. These bearings require no readjustment or attention, except oiling.

The electrical control of this machine is through a start and stop push button station placed near the handle within easy reach of the operator. The support is so balanced that little of the operator's strength is taken in moving or swinging the machine. The handle is adjustable and can be fastened in any position from the horizontal upward to an angle of 45 deg. The machine is furnished ready to run in four sizes, namely, with a wheel 14 in. by 2 in. driven by a 3-hp. motor 1,800 r. p. m.; a wheel 18 in. by 3 in., driven by a 5-hp. motor at 1,200 r. m. p.; a wheel 24 in. by 3 in., driven by a 7½-hp. motor at 900 r. p. m., and a wheel 14 in. by 2 in., driven by a 3-hp. motor at 1,500 r. p. m.

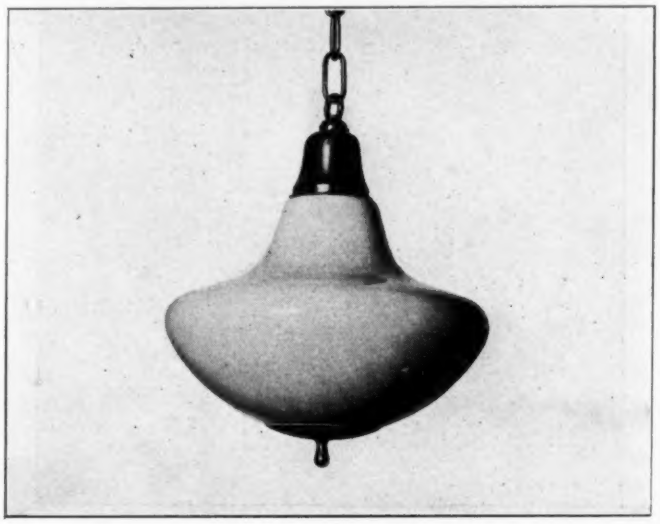
Changes in Nathan Low Water Alarm

THE Nathan low water alarm, which is being exhibited by the Nathan Manufacturing Company, 250 Park avenue, New York, is actuated by the expansion and contraction of metal under changes in temperature. Several changes have been made in the device which was formerly known as the Sentinel low-water alarm. A reach rod extending from the bell crank to the upper end of the drop pipe has been provided to assist in adjusting the contact stud. The bell crank lever is adjusted with the reach rod so that the center line of the whistle valve will be in line with the contact stud. When the bracket is properly adjusted, spacers or hard spelter babbitt are put under the bracket base. A shut-off valve, L^1, has been provided, which is located at the front end of the expansion tube. It is used to test the alarm.

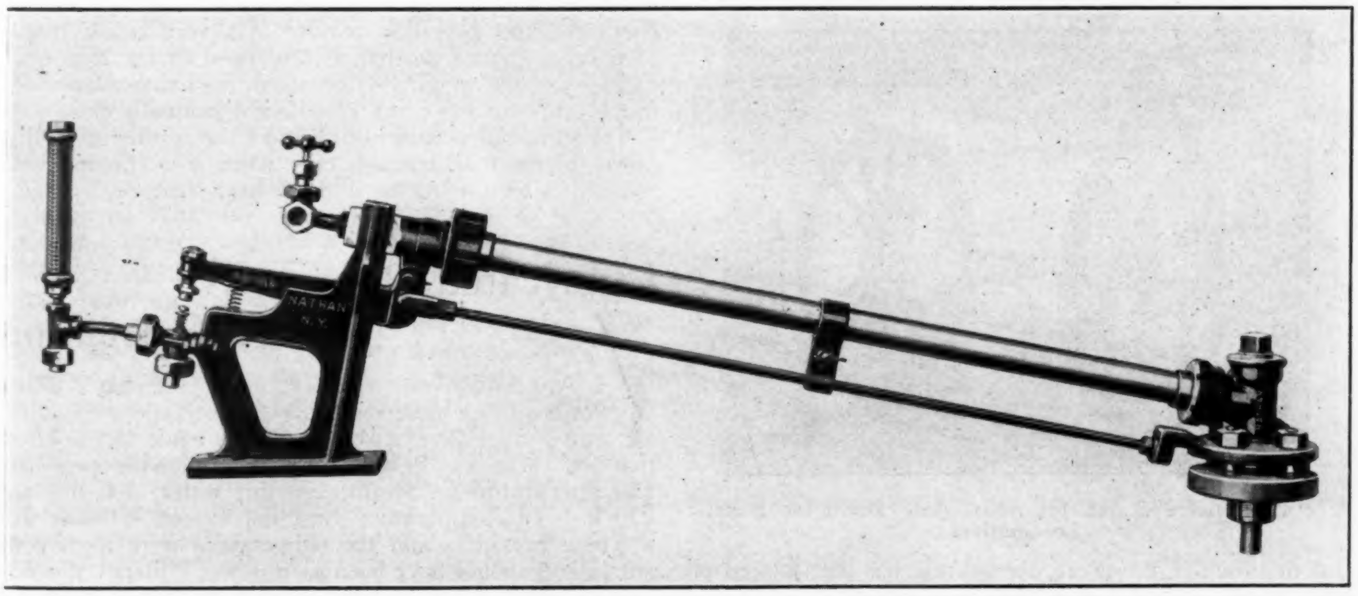
A three-pass perforated baffle has been placed in the expansion tube at the fixed end.

New Line of Sol-Lux Junior Hangers

THE Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., is exhibiting a new line of Sol-Lux hangers, namely, the Sol-Lux Junior hanger for use with Sol-Lux globes. These hangers consist of three types, the medium suspension hanger, the Mogul suspension hanger, and the medium ceiling hanger. They have all the advantages of the Sol-Lux hanger, and are regularly furnished in dull bronze finish.



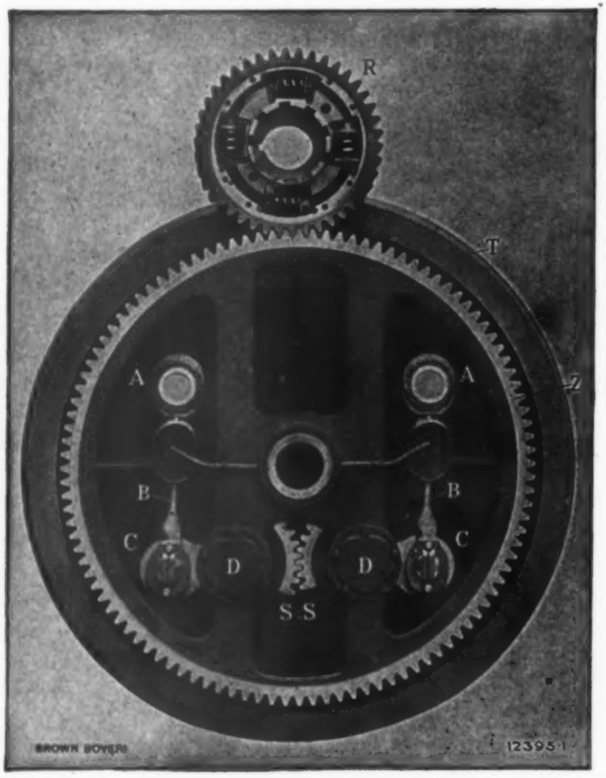
Sol-Lux Junior Hanger—Canopy and Upper Part of Chain Not Shown



The Nathan Low Water Alarm May Be Tested by Opening the Shut-Off Valve

Individual Axle Drive for Electric Locomotives

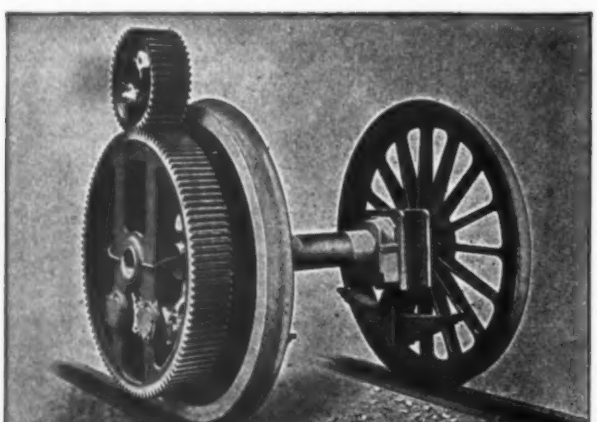
AN INDIVIDUAL axle drive for electric locomotives is being exhibited by the American Brown Boveri Electric Corporation, 165 Broadway, New York. One of the illustrations shows the arrangement of the in-



Gear Wheels With the Brown Boveri Coupling Device and Driving Wheel

A—Coupling Pins Mounted on the Driving Wheels and Passing through Openings in the Gear Wheel; B—Coupling Rods; C—Knuckle joint of the Coupling Rod and Segment Levers; D—Fulcrum of the Segment Levers; R—Pinion; S—Toothed Segments; T—Driving Wheel; Z—Gear Wheel

dividual axle drive for a single axle, comprising the driving wheel, the coupling device and the gearing. It is of importance to have as much space as possible available for



The Gear Drive of the Individual Axle Drive for Electric Locomotives

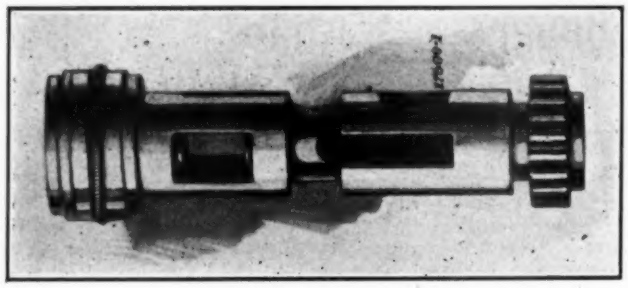
the motors and, therefore, the gearing has been placed on the outside of the frame, this also permitting a greater width of gears.

The gear-wheel is connected with the driving wheel by means of a special coupling device, but is not otherwise connected to the driving axle. Two pins, which are fixed to the driving wheels, act as a focus for two segmental gears, the forked ends of which engage the coupling rods through universal joints. The other ends of these coupling rods, through universal joints, engage two pins fixed to the drive wheel. This arrangement permits full freedom of action between the gear wheel and the locomotive drive wheel. Consequently, in case of tire wear, it is necessary to replace the tires only on the driving axle affected.

The gearing and bearings are lubricated through an automatic, mechanical lubrication which does away with the periodical filling of oil cups.

Centrifugal Governor for Air Tools

THE Ingersoll-Rand Company, 11 Broadway, New York, has recently embodied in the design of its four-cylinder pneumatic drills a centrifugal type governor which is designed to control the idling speed and to promote economy in air consumption on these tools. Unlike many governors, the controlling action of this particular type is brought about by a restriction in the exhaust passages of the air drill, rather than a throttling effect on the air supply. The illustration shows the gov-



Ingersoll-Rand Gear-Timed, Air-Balanced Main Valve Fitted with Centrifugal Governor

ernor, which is located on the upper end of the rotary main valve. It consists essentially of two fly weights which are held in place by a circumferential spring. In operation, the governor feature acts very much like a diaphragm shutter so that as the speed of the motor increases and the weights fly outward, the exhaust openings in the center of the crank spindle are gradually closed.

The governor is said not to affect the torque or pulling power of the tool, but acts only when it is running with too light a load or racing with no load whatever.

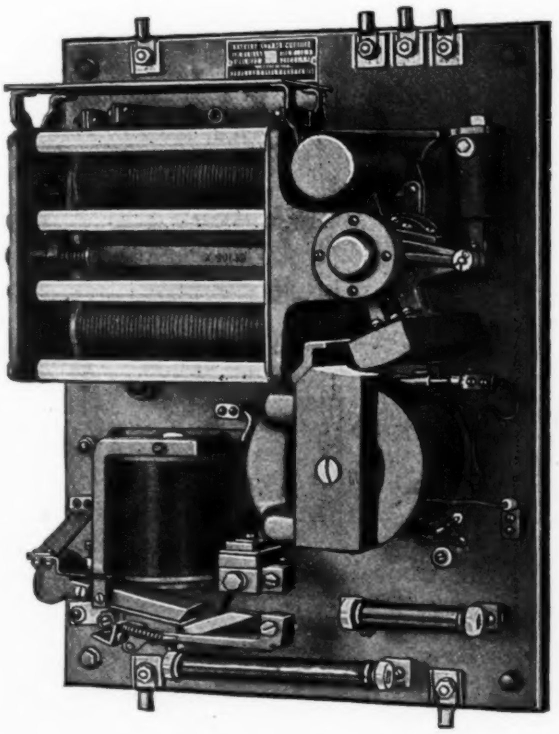
Lubricated Plug Valve—A Correction

IN AN article on page 1796 of yesterday's *Daily Railway Age* describing the Barco Type ACI lubricated plug valve, a statement was made to the effect that the valve was designed for the following pressures and temperature: "Steam, 150 lb.; water, 300 lb.; air, 250 lb. The temperature must not exceed 400 deg. F."

These pressures and the temperature were incorrectly stated and should have been as follows: "Steam, 250 lb.; water, 500 lb.; air, 250 lb. The temperature must not exceed 450 deg. F."

Lighting Regulation of Gas-Electric or Oil-Electric Cars

DEVELOPMENT and success of the gasoline-electric, or oil-electric drive for rail cars and locomotives has introduced a problem of battery charge which has been solved by The Safety Car Heating & Lighting Company, New Haven, Conn., with its new battery charge control. The gas-electric or oil-electric



Type F Battery Charge Control Regulator No. 25937

unit requires a battery for lighting as well as excitation at low engine speeds. Since there is enough electrical energy available in the main power unit, it is natural to utilise some of this source for charging the battery rather than provide a separate generator for the purpose. The exciter being of relatively low voltage is therefore called upon to charge the battery. Due to the purpose of this generator, its voltage is variable, and consequently adequate regulation must be provided to charge the battery fully in the least possible time, and yet protect it from dangerous effects of overcharging.

With the safety regulator, whenever the exciter voltage reaches that value for which the main switch is set, it closes and connects the battery to the exciter in series with the carbon pile of the regulator.

The main switch or reverse current relay furnished with the battery charge control regulators can be one of two types; one being an automatic switch of the closed magnetic circuit type with pivoted armature. For units with small lamp load, where accuracy of lamp regulation is not desired, life of the bulbs may be increased by the use of a fixed resistance control. With this arrangement, a resistance is automatically inserted in the lamp circuit whenever the battery is connected to the generator by the reverse current relay. The contactor which shorts the resistance in the lamp circuit when the lamps are fed directly from the battery is mounted on top of the reverse current relay.

Diesel Engine Liners of Hunt-Spiller Gun Iron

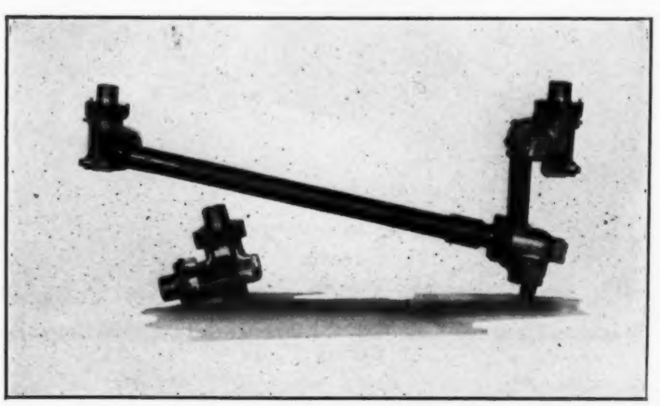
THE tendency toward utilization by the railroads of the Diesel-electric locomotive has necessitated considerable study of Diesel engine maintenance on the part of the railroads and the manufacturers. Special emphasis is being placed on the character of the material used for cylinders, pistons and rings. One of the exhibits

Two Liners for Diesel Engine Cylinders Made of Hunt-Spiller Gun Iron

of the Hunt-Spiller Manufacturing Corporation, 383 Dorchester avenue, Boston, Mass., are gun iron liners for the cylinders of Diesel engines. Liners made of Hunt-Spiller gun iron are said to have been meeting quite successfully the requirements of Diesel engine service and to possess the uniform structure, high tensile strength and wearing qualities essential for these parts.

Franklin Sleeve Joint

A SLEEVE joint which is a modification of the McLaughlin joint is being exhibited by the Franklin Railway Supply Company, 17 East Forty-second street, New York. It has been designed to facilitate the



Franklin Sleeve Joint for Use Between Engine and Tender

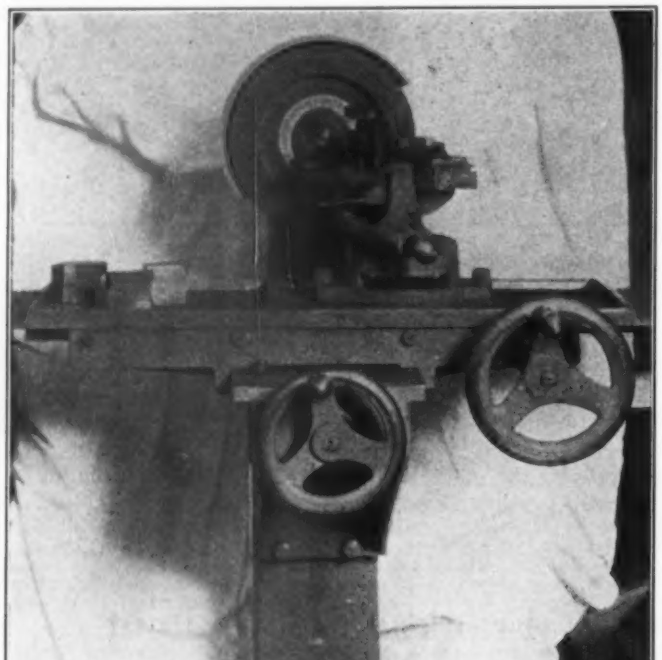
application and lengthen the life of the moving parts. The overhang of the double joint has been materially reduced and the length of bearing for the sleeve, considerably in-

creased. This makes it possible to put the joints closer together where several sets are used. The change in the sleeve insures it being held squarely against the packing gasket, even after the joint has seen long service.

Gaskets for this joint are interchangeable with these for the McLaughlin joint and the spanner nut method of locking is used.

Davis Cutter Grinding Machine

THE Davis Boring Tool Company, St. Louis, Mo., is exhibiting a cutter grinding machine especially designed to meet the requirements of all shops for grinding cutters as used in Davis expansion boring tools. The machine is compact, simple to operate and provides an accurate and reliable method of grinding cutters to a



Machine Used for Grinding Cutters Used in Davis Expansion Boring Tools

correct length and form. The table has ample longitudinal and cross feed, no vertical adjustment being necessary.

The cross feed dial is marked with a micrometer adjustment, enabling the operator to adjust the table in or out to the required position, thereby permitting an inexperienced operator to grind cutters correctly in the least possible time.

The cutter grinding attachment has a swivel base which is tilted two ways and rotates in a manner that grinds two separate and distinct angles and the correct radius with one movement in either direction by means of a ball handle. It rotates for a distance right and left coming in contact at the end of each stroke with the positive dust-proof hardened stops.

Three gage posts are supplied with taper shanks and are inserted into the swivel base for rotating all sizes of cutters in position for obtaining the proper radius on the cutter. Hardened adjustable clamping fingers and stops hold the cutter in position for accurate grinding. The grinding adjustment is supplied with adjustable stops, thus accommodating every size of boring tool cutters from 1/8 in. by 1/2 in. by 7/16 in. to 1 1/4 in. by 2 in. by the maximum length.

The spindle is made of heat treated alloy steel and runs in Timken roller bearings.

Four-Pole Train Control Generator

AN 800-WATT turbo-generator set having a four-pole generator for locomotive lighting and train control service is being exhibited by the Sunbeam Electric Manufacturing Company, Evansville, Ind. It is

Sunbeam, Type R-4, Headlight and Train Control Set

known as type R-4 and is similar in appearance to the R-3 two-pole machine except that it has three feet for mounting instead of four. The turbine ends of the two machines are identical in all details.

The shaft is made heavy to reduce vibration to a minimum and is mounted on two No. 306 ball bearings as required by A. R. A. specifications. The generator has four poles on which the field coils are wound. These poles are fastened to a ring which is removable. After the end bearing is removed, four bolts can be removed from the main casting and the entire field assembly pulled out. There are four brushes and the brush holders are mounted on a ring which can be taken out as a unit. The armature is wave-wound and any brush may be lifted without disturbing the commutation or flow of current. The generator is rated at 800 watts, 32 volts and runs at 2600 r.p.m. The machine is totally enclosed and is provided with a water-tight terminal box. The weight complete is 185 pounds.

Niles 90-in. Wheel Quartering Machine

THE Niles-Bement-Pond Company, 111 Broadway, New York, has in operation in its exhibit a 90-in. wheel quartering machine which is regularly arranged for boring simultaneously both crank pin holes in a pair of drivers. By the use of the crank pin turning attachment, pins mounted in the wheels can also be turned.

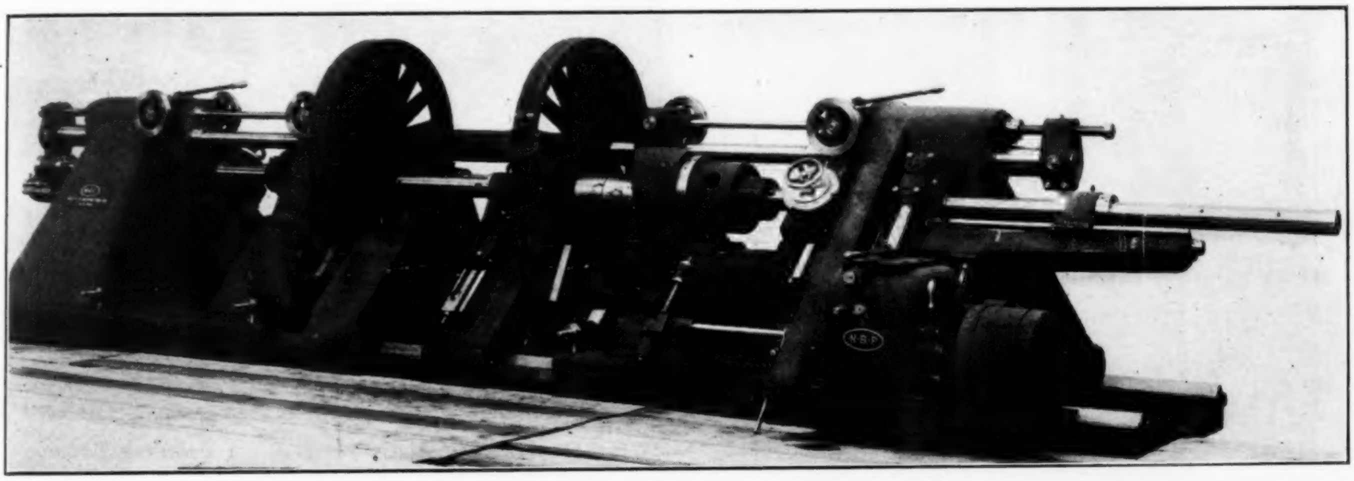
The machine is provided with a right and left headstock. These heads slide on large 90-deg. vee-ways on the bed which keeps them in alinement with each other. The center to center distance of the ways is 48 in. The heads are adjustable laterally along the bed by power and each is secured by means of long shoes fitted underneath the ways and set up to a sliding fit. They are clamped in position, both front and back, by an eccentric clamping device actuated by a wrench, and can be clamped effectively from either position. The wheel sets are carried on centers set in large sliding spindles adjusted through a screw operated from hand wheels conveniently located, one on each side of the head. The spindles are clamped at the front by a lever.

The quartering saddle spindle is mounted in each headstock, having an adjustment toward and from the dead spindle centers from 11 in. to 20 in., which is equivalent to 22 in. to 40 in. piston strokes. Adjustment is made by hand through a screw and to facilitate the setting to a predetermined stroke, scales are provided giving the position of the boring bar in relation to the axle centers. The front portion of the saddle is gibbed and is secured to a square lock bearing planed on the headstock. The thrust is taken on two guides, one on either side of the spindle, which eliminates the distorting strains which are inevitable when the saddle is bolted to the side of the headstock.

The boring bar, which is 4½ in. in diameter, is provided with hand and power traverse for lateral movement. Each bar is supported on the outer end of the saddle and kept in alinement with it by an outboard bearing which also carries a nut for the feed screw. To prevent overtravel of the bar when feeding or traversing in either direction, adjustable limit switches are fitted to the saddle which automatically shut off the power from the driving motor when the bar has reached the safe limit of its travel. The feed mechanism for the spindle is contained in the saddle, providing two feeds, 1/32 in. and 1/16 in., and is so arranged that it is impossible to operate the fast traverse of the bar while the feed is engaged, and vice versa. Feeds and fast traverse can be reversed by a lever conveniently located on the top of the speed box.

The weel set is supported from each journal by two compensating vee-blocks, which are free to slide on a large elevating member, the lower end of which is threaded for the purpose of raising or lowering to take care of the variation in the size of journals. A worm gear is fitted on the threaded portion, by revolving which the supporting member is moved vertically. The supporting bracket also carries the outboard bearing for the boring bar, scales being inset on the sliding surface for ease in setting the outboard bearing to correspond with the setting of the spindle saddle. The support brackets are adjusted laterally on the bed, in or out in relation to each other by a left and right-hand screw operating through a large handwheel, and engaging in bronze nuts in the support bases.

A wing is provided on each bracket to which the wheels are clamped in position for quartering. To bring the wheels into the proper location for quartering, adjustable links are provided one for each head. One end of each link is affixed to a C-clamp applied to the tire or rim of the wheel center, the other to an I-bolt in the bed.



The Niles 90-in. Wheel Quartering Machine with Crank Pin Turning Attachment in Place

Each boring spindle is independently driven by its own motor through a large worm and worm wheel running in oil. A speed gear box giving two changes of speed is interposed between the motor and the boring spindle.

The machine may be driven by two direct current shunt wound, 5-hp., 2 to 1 variable speed motors, having a speed range of 650 to 1,300 r.p.m. Each motor is equipped with automatic controller, with start, stop and inching push button stations, and separately mounted field rheostat for obtaining the speed range of the motor. In conjunction with the two mechanical speeds in the gear box, boring bar speeds range from 5.7 to 11.4 and 11.9 to 23.8 r.p.m.

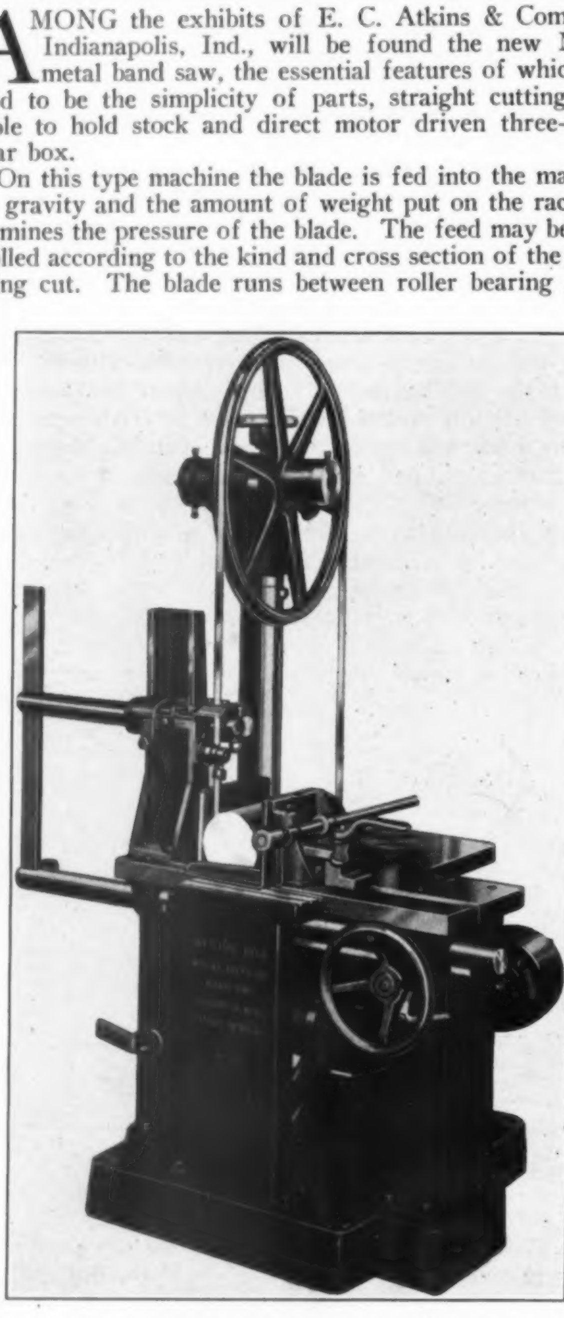
The machine can also driven by two alternating current 5-hp. squirrel cage induction motors having a speed of 1,150 r.p.m. The two boring spindle speeds of 10 and 21 r.p.m. are obtained through speed box.

Double crank pin turning attachments of the box tool type so that two pins may be turned simultaneously, can be furnished.

Atkins Metal Cutting Band Saw

Among the exhibits of E. C. Atkins & Company, Indianapolis, Ind., will be found the new No. 4 metal band saw, the essential features of which are said to be the simplicity of parts, straight cutting, low table to hold stock and direct motor driven three-speed gear box.

On this type machine the blade is fed into the material by gravity and the amount of weight put on the rack determines the pressure of the blade. The feed may be controlled according to the kind and cross section of the stock being cut. The blade runs between roller bearing guide rollers above and below the table that holds the stock. It is claimed that these rollers will maintain the horizontal and vertical alinement of the blade so that cuts may be made to very close limits. The tension on the blade is maintained by means of a handwheel on top of the column. A feature claimed for this machine is the small amount of time necessary to change the stock to be cut.



Provision is Made on this Machine for Both Vertical and Horizontal Blade Alinement

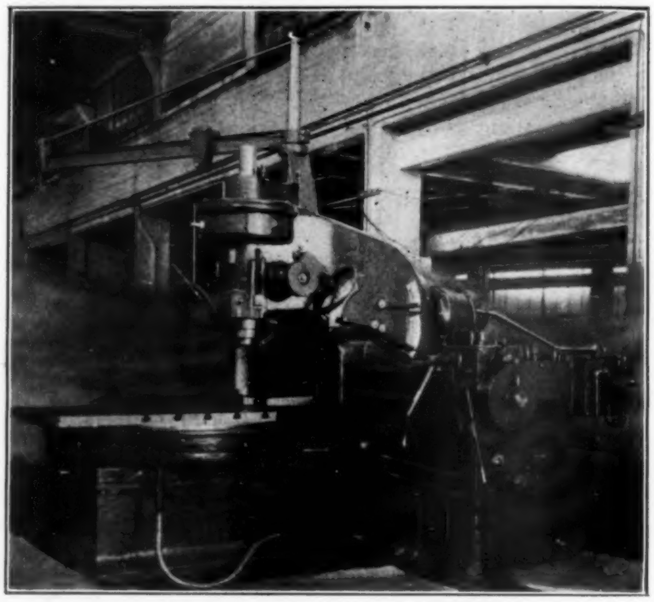
The capacity of the machine is 12 in. by 18 in.; the weight is 1,500 lb.; the floor space necessary is 36 in. by 50 in. and the height over all is 74 in. The table is 13 in. by 32 in. and is 28 in. from the floor.

All parts of the machine, with the exception of the motor and the interior of the gear box are exposed and accessible for cleaning. All moving parts are mounted in either roller or ball bearings. The gears are hardened and run in an oil bath.

Vertical Rod Profile Milling Machine

A Newton vertical rod miller is being exhibited by the Consolidated Machine Tool Corporation of America, Rochester, N. Y., which is especially adapted for profiling locomotive rods and straps. It is of rugged proportions, permitting wide bearing surfaces which makes it possible to take extra heavy cuts with practically no vibration. This machine affords a wide range of adjustment since the upright is made with a cross travel on the base. It is provided with hand adjustment, power feed, and rapid traverse in both directions.

The table has a 54-in. diameter working surface with tee-slots conveniently located and rotates on the saddle either by hand adjustment, power feed, or rapid traverse, in both directions. The table saddle moves in and out and is also provided with hand adjustment, power feed or rapid traverse. The spindle drive is by helical gears enclosed to run in oil. A wide variation of speeds are obtained through sliding gears in the head with levers located for the convenience of the operator.



Milling Machine Especially Adapted for Profiling Locomotive Rods and Straps

Both the table and upright have 18 changes of feed through a six change feed box and transposing gears. The central levers are all brought to one point for the convenience of the operator.

The drive is taken from a 30-hp. constant speed motor, mounted on the back of the upright, and is direct gear connected to the machine.

* * *

The Merchants' Association of New York is opposing two of three railroad bills now pending before Congress; the Association having acted upon the measures at the request of shippers of New York City. One bill meeting opposition is that which would require inclusion of at least one day coach in each extra-fare train, while another measure disapproved by the Association would compel every carrier desiring to change a freight, express or passenger rate to file application with the Interstate Commerce Commission, which must then hold a hearing upon the application within sixty days.